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DYSPEPSIA

WORKS BY

W. SOLTAU FENWICK, M.D.

Dyspepsia: Its Varieties and Treatment

Cancer and Other Tumours of the Stomach

Ulcer of the Stomach and Duodenum

Disorders of Digestion in Infancy and Childhood

The Dyspepsia of Phthisis

WITH THE LATE DR. SAMUEL FENWICK

The Student's Guide to Medical Diagnosis Ninth Edition

Outlines of Medical Treatment Fourth Edition

DYSPEPSIA

ITS VARIETIES AND TREATMENT

BY

W. SOLTAU FENWICK, M.D., B.S. (LOND.)

LATE PHYSICIAN TO THE EVELINA HOSPITAL FOR SICK CHILDREN, ETC., ETC.

SECOND EDITION, REVISED

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PREFACE TO SECOND EDITION

THIS book has been out of print for several years, but hitherto it has been found impossible to prepare a new edition. No alteration has been made in the general scheme of the work, but it has been carefully revised and the chapter dealing with the displacements of the viscera has been re-written. Clinical experience indicates that since the war secretory disorders of the stomach have greatly increased in frequency, while those varieties of dyspepsia which owe their origin to primary myasthenia and toxic inflammations of the stomach have become relatively rare. More extended observations have confirmed the Author in his opinion that gastroenteritis in infancy exerts an important influence upon the digestive functions during adult life, and also that several distinct varieties of indigestion are associated with congenital visceroptosis. Chronic appendicitis is a frequent result of visceral displacement and is occasionally accompanied by glycosuria or an intractable form of pruritus, which disappears after the diseased organ has been removed. The Author tenders his grateful thanks to Mr. Cairns Forsyth for his assistance with the surgical treatment of dyspepsia, and to Dr. James Fenton, Medical Officer of Health to the Royal Borough of Kensington, for much information with regard to the adulteration of foods.

W. SOLTAU FENWICK.

138 HARLEY STREET, LONDON, W.1.
September 1924

PREFACE TO FIRST EDITION

THE scheme upon which the present work is based was drawn up by the author more than sixteen years ago. Only a few chapters had been written, however, before it became evident that the subject was infinitely more complicated than had been imagined, and the manuscript was accordingly put aside until sufficient knowledge had been gained to warrant a fresh attempt. In the meanwhile a series of special researches were undertaken upon the etiology of the various forms of dyspepsia, and monographs dealing with such cognate subjects as Disorders of Digestion in Childhood, Ulcer of the Stomach, and Cancer of the Stomach were published.

The present volume is the outcome of the clinical experience gained by the personal examination and treatment of more than eighteen thousand persons suffering from indigestion; but since the data thus obtained proved too unwieldy for analysis, the statistical inquiries quoted in the text were confined to one thousand examples of the complaint, five hundred of which were examined in hospital and five hundred in private practice. These were taken in the order in which they came under observation and were all subjected to the same methods of investigation, so that the results probably indicate with a fair degree of accuracy the relative frequency of the different types of dyspepsia in general and special practice respectively.

The difficulties which beset the clinical study of indigestion are due in great measure to the almost universal disposition to regard the condition as a substantive disease dependent upon a primary failure of the gastric functions, whereas, in a large proportion of the cases, the symptoms originate

entirely in the intestines or ensue from a derangement of the liver, pancreas, or bowel. Moreover, a disturbance of digestion in the stomach itself is rarely due to a primary disorder of that viscus, but is usually a consequence of disease of another and perhaps remotely situated organ of the body. The truth of this apparent paradox will be appreciated when it is remembered that the majority of the secretory, motorial, and inflammatory affections of the stomach result from the failure of some other organ to execute its proper functions.

It is also seldom understood that chronic indigestion is never due to the perversion of a single physiological process, or that the digestive apparatus is of such delicate construction and perfect adjustment that the slightest disturbance of one of its parts will eventually throw the entire mechanism out of gear. Thus, a continuous secretion of gastric juice, secondary, perhaps, to disease of the appendix, will in the course of time produce inflammation of the mucous membrane of the stomach, gastrectasis, and motor insufficiency, which in their turn may be followed by functional derangements of the liver and pancreas, enteritis, and even by ulceration of the duodenum. It is only by careful investigation of each individual case that the initial disorder can be ascertained and a clue obtained to the numerous and diverse conditions which so often obscure the original complaint.

The problems of dyspepsia are further complicated by the imaginative nomenclature with which the subject has been clothed and by the exaggerated importance accorded to phenomena of a secondary and purely subsidiary character. The term "dilatation of the stomach" appears to be regarded by the medical profession not only as an invariable accompaniment of indigestion, but as an actual disease of the stomach, which through the medium of "fermentation" and "auto-intoxication" is capable of producing every symptom which the human mind can conceive. Quite

apart, however, from the fact that gastrectasis can rarely be diagnosed by the methods commonly employed for its detection and that it is usually confounded with gastroptosis, those who worship this fetish of their imagination never realize that gastric dilatation is not a primary condition, but is merely a consequence of some long-standing functional or organic disease of the viscus. No true clinician would dream of maintaining that dilatation of the heart was a primary disease or would be content to treat it without making some attempt to ascertain its cause ; yet few ever regard dilatation of the stomach as the result of a definite lesion or grasp the fact that gastrectasis is not a disease but merely the consequence of one. The existence of gastric dilatation in a case of dyspepsia, although of great importance from the point of view of prognosis and treatment, no more explains the nature of the indigestion than the discovery of a dilated heart indicates the disease from which it has arisen.

In the first chapter, a short scheme is offered for the clinical differentiation of the various forms of dyspepsia. This was originally drawn up for the benefit of those medical men who attended the author's demonstrations upon diseases of the stomach; but since it has stood the test of time and appears to have been of some use, it is now published for the first time.

Its sole value is to concentrate attention upon such clinical indications as serve to distinguish one form of the complaint from another and to emphasize the importance of discriminating between disorders of function as opposed to mere symptoms. It makes no claim to exceptional accuracy, nor can it be usefully employed unless the student possesses a good general knowledge of the diseases to which it refers. It cannot be too clearly understood that the science of gastric diagnosis is the art of taking trouble, that it is at all times diametrically opposed to guesswork, and that an accurate recognition of the nature of a complaint is the only possible basis for curative treatment.

One of the most interesting varieties of dyspepsia is that which ensues from a continuous secretion of the gastric juice. Hitherto it has been the custom to regard this hypersecretion as a primary neurosis of the stomach, but there can be little doubt that it is usually a secondary phenomenon dependent upon an organic lesion of the digestive organs. It is in this connexion that the relationship of latent disease of the appendix vermiformis to dyspepsia becomes apparent, since in almost every instance where the appendix is diseased some perversion of the gastric functions may be detected. Thus, when the organ is ulcerated or contains a calculus a typical hypersecretion is usually found to exist; while if it be merely thickened, twisted, or adherent, owing to previous attacks of acute inflammation, a form of chronic gastritis is apt to supervene which not only obscures the original disorder of secretion, but closely simulates the clinical features of so-called nervous indigestion.

The long-continued existence in the stomach of a hyperacid fluid is apt to induce severe gastritis accompanied by numerous erosions of the mucous membrane. These minute losses of tissue sometimes occasion profuse hæmorrhages, but since they only appear as bleeding points when the stomach is opened at operation, the condition is often ascribed to a morbid affection of the blood-vessels. In several of the cases which are included in the table relating to the etiology of hypersecretion, recurrent attacks of hæmatemesis and melæna were observed, which disappeared along with the previous symptoms of indigestion as soon as the diseased appendix had been removed. A simple erosion of the stomach or duodenum is, however, always liable to be converted into a genuine perforating ulcer by the persistent irritation of the gastric secretion, and consequently many cases of primary appendicular hypersecretion are eventually complicated by these lesions. The biliary form of hypersecretion is also frequently followed by duodenal ulcer from

the same cause, while that which ensues in the first instance from a simple ulcer is often attended in the course of time by gall-stones and appendicitis. These three organic complaints appear, therefore, to be etiologically linked together by a secondary perversion of the gastric secretion which is common to each. The occasional failure of gastro-jejunostomy to remove the symptoms of a duodenal ulcer is often due to concomitant disease of the gall-bladder or appendix which had been overlooked at the operation.

The exact significance of simple hyperchlorhydria is at present difficult to define, since, although a temporary increase in the acidity of the gastric juice is of frequent occurrence, it is extremely doubtful whether persistent hyperacidity ever exists independently of hypersecretion.

In the chapter which deals with gastric myasthenia, special attention is directed to the latent period of the complaint and to the comparative rarity of true gastrectasis. The subject of inflammation of the stomach as a cause of dyspepsia has been condensed to the smallest possible compass, and only those varieties are described which are endowed with practical interest. If it were always borne in mind that chronic inflammation of the stomach is invariably due either to toxic poisoning or to serious disease of some other vital organ of the body, the term "chronic gastritis" would no longer be applied indiscriminately to every form of dyspepsia, nor would its existence be regarded as a matter of so little consequence.

Displacements of the stomach constitute a subject of great clinical interest, to which either too much or too little importance is usually attached. The fact that gastroptosis exists in many persons who never suffer from dyspepsia appears to indicate that the abnormal position of the stomach is compatible with perfect digestion; while the existence of impaired motility or some secretory disorder in every case which exhibits symptoms of indigestion serves

once more to emphasize the necessity of distinguishing between primary diseases and their consequences. Gastroptosis is so exceptionally frequent in the subjects of migraine, that future investigations will probably demonstrate a causal connexion between the two complaints.

Special prominence is accorded to those varieties of dyspepsia which develop during infancy and old age, and attention is directed to the pathological changes which occur in the mucous membrane of the alimentary tract at these periods of life.

Former writers were wont to lay much stress upon sympathetic disturbances of the stomach, and although this conception of the etiology of secondary dyspepsias has been abandoned, a study of gastric digestion when other important viscera of the body are attacked by disease serves to throw considerable light upon certain vicarious functions of the stomach and constitutes a subject of the highest practical importance.

Intestinal indigestion almost defies exact clinical analysis. In addition to the symptoms that ensue from the usual composite variety, those which arise from a primary functional derangement of the duodenum, liver, and pancreas are accorded separate descriptions, while a short account is given of those recurrent attacks of abdominal pain due to a tetanic contraction of the intestine which are usually confounded with gastralgia.

The treatment of the various subjects is considered upon broad lines and no attempt is made to enumerate the vast number of drugs which at one time or another have been recommended for the relief of indigestion. The author's sincere thanks are due to Dr. Herbert Rhodes for his kind assistance during the passage of the work through the press.

W. Soltau Fenwick.

29 Harley Street, London.
June 1910.

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CHAPTER I

THE VARIETIES OF DYSPEPSIA AND THEIR DIFFERENTIAL DIAGNOSIS

THE classification of dyspepsia has always been a matter of the greatest difficulty, and it only requires a glance through the literature of the subject to understand what an amount of ingenuity and trouble has been expended upon the problem of assigning the various symptoms of maldigestion to their proper causes. As might naturally be expected, a purely symptomatic nomenclature held almost undisputed sway through many centuries; and, indeed, it was not until the study of physiology had made considerable progress that derangements of function as opposed to the so-called morbid states of the stomach became clearly recognized; while the subsequent rapid advance of pathology helped still further to eliminate the effects of organic disease and to establish the true relationship of gastric inflammation to certain disturbances of digestion. As a result of these various researches, the so-called "Flatulent," "Acid," and "Irritative" forms of dyspepsia which were included in the ancient description of the disease were superseded by such expressions as "Atonic," "Inflammatory," and "Nervous" indigestion, while many symptoms which had hitherto been regarded as gastric in origin were now accurately referred to a disturbance of the intestinal functions.

The introduction of lavage by Kussmaul in 1869 and the subsequent adoption of a soft tube for exploration of the stomach led to a great increase of our knowledge respecting

the chemistry of digestion under both normal and pathological conditions, and although the subject is still very obscure and even the most careful and extended observations upon the same disorder bristle with apparent contradictions, it is yet possible to attribute certain subjective phenomena to definite alterations in the secretory, motorial, or absorptive functions of the alimentary tract.

Such a statement will probably be considered far too qualified, and, indeed, many modern writers seem to be of the opinion that experimental research has not only solved all the problems of indigestion, but has also revolutionized the treatment of functional disorders of the stomach. Far from this being the case, however, it will be conceded by most practical physicians that many ancient empirical methods are still of the greatest value, despite the fact that experiments are supposed to have proved them to be unscientific in origin and useless in application. In like manner, attempts to treat disorders of digestion upon lines laid down in the laboratory reveal still further discrepancies between what the human stomach is expected to do and what it actually does, with the result that the various artificial aids to digestion, drugs that are supposed to influence gastric secretion and motility, as well as the numerous foods which are prepared to ensure their immediate absorption, although excellent in their way, are all found in practice to possess one inherent drawback—they seldom do what is expected of them. This failure of clinical experience to corroborate the deductions from physiological research is obviously due to the profound difference that exists between the subjects of the two classes of experiment—a healthy dog and an unhealthy man. In my opinion two elementary distinctions must always exist between an animal used for such experiments and a dyspeptic individual, namely, the absence of psychical influences in the animal and the invariable disturbance of all the func-

tions of the human stomach which ensues from the derangement of one. In the case of the animal the stomach is perfectly healthy, and in so far as psychical influences are concerned the organ is practically a machine. But in the human subject the all-controlling influence of the nervous system is perpetually in evidence, altering the composition of the various secretions, exciting or inhibiting peristalsis, and retarding or accelerating absorption through the influence of accidental psychical impressions or as the result of some constitutional defect of the organism. This all-powerful nervous influence constitutes the greatest obstacle to the treatment of every form of dyspepsia, and its existence in the human subject is of itself sufficient to nullify most of the conclusions which might otherwise have been drawn from experimental research.

A simple clinical illustration will suffice to make this fact clear. In the disorder known as hypersecretion, careful dieting and treatment will usually secure immunity from pain, vomiting, and other symptoms for a considerable time, while repeated analyses of the gastric contents show a corresponding diminution of the acid secretion. But if during this period of latency the patient sustains a physical shock, experiences some violent emotion, or even receives depressing news, the former symptoms will recur within an hour or two, spasmodic closure of the pylorus produces food retention, a marked increase of hydrochloric acid occurs, and not infrequently a serious attack of gastric intolerance supervenes. This sequence of events is not the exception, but the rule ; and it is highly probable that, were it not for the intimate connexion between the secretory activity of the stomach and the central nervous system, hypersecretion would usually be susceptible of cure.

But the second distinction is of equal importance. The term dyspepsia, if it means anything, is an acknowledgment of a disorder of the gastric functions, and consequently the

results of experiments conducted upon a healthy stomach, whether it belongs to an animal or to a man, can never logically be compared with those obtained from the viscus in an abnormal condition. Moreover, there is no such thing as a derangement of a single function of the stomach, for it can easily be proved that the slightest disturbance of any portion of the intricate machinery of digestion will throw out of gear the entire mechanism, and that an alteration of secretion, for example, is soon followed by a perversion of motility and sensibility, as well as by a profound derangement of the intestinal functions. In illustration of these facts the condition known as subacidity may be instanced. Pawlow has shown that in a dog the strongest stimulants of gastric secretion are water and meat extract, and it has consequently been assumed that the administration of soup or broth at the commencement of a meal should excite both the appetite and the gastric secretion of a person suffering from this chemical indication of impaired digestion. But in cases of gastric subacidity the perversion of secretion is rarely a primary complaint, but is usually an expression of chronic inflammation of the stomach attended by an impairment of motility and other abnormal conditions of the digestive organs. It is, therefore, invariably found that the administration of water or broth at the commencement of a meal in such cases not only destroys any remnant of appetite that may have existed, but, by diluting the already enfeebled gastric secretion and distending the too distensible stomach, intensifies the very symptoms which the treatment was expected to allay.

It would appear that Abernethy foresaw the future influence of theoretical teaching upon medical practice when he uttered the well-known dictum, " The stomach is neither a stew-pan nor a test-tube, but a stomach."

The Varieties of Dyspepsia.—Dyspepsia may ensue from a disorder of any part of the digestive tract or of the various

organs whose secretions are necessary to the solution and absorption of the food. Two primary varieties must, therefore, be recognized, the *gastric* and the *intestinal.*

Gastric dyspepsia may arise in many different ways. Thus, if the secretion of the organ be poured out in insufficient quantity or if it be lacking in hydrochloric acid, the carbohydrate constituents of the meal will undergo excessive fermentation with the production of various gases and organic acids ; while an excess of hydrochloric acid causes the stomach to empty itself more rapidly than usual or produces a painful spasm of the pyloric muscle. In like manner, a continuous secretion of gastric juice deprives the viscus of its necessary periods of rest and, by irritation of the mucous membrane, occasions severe discomfort and secondary inflammation of the organ. Enfeeblement of the muscular coat of the stomach causes food to stagnate and to undergo decomposition, the gaseous products of which, by distending the organ and stretching its tissues, still further diminish its muscular power. Derangements of the nervous mechanism are more obscure in their effects than other functional disorders, but it is certain that an exalted sensibility of the gastric mucosa is attended by severe pain immediately food is brought into contact with the abnormally sensitive structure ; while interference with the adequate closure of the cardiac orifice causes the constant regurgitation of small quantities of chyme. A mixed neurosis affecting both sensation and motility, and accompanied by symptoms of general neurasthenia, constitutes the obscure and complex disorder known as neurasthenia gastrica or nervous dyspepsia. Alterations in the position of the stomach, whether congenital or acquired, oppose a mechanical obstacle to the propulsion of food into the duodenum, and by causing secondary perversions of the other gastric functions may give rise to a form of dyspepsia which can only be distinguished from gastric neurasthenia

by careful examination of the abdomen. But in addition to primary aberrations of function and to abnormalities of position, the stomach, like other organs of the body, is extremely liable to suffer from inflammation, the result of which is to diminish both its secretory and motorial activity and to increase the sensibility of its inner surface. The dyspeptic symptoms that ensue from gastritis are consequently of a mixed type and liable to become chronic owing to the organic changes which occur in the mucous membrane. All substances that find their way into the stomach do not necessarily contribute to the nourishment of the body, and if, owing to their nature, size, or consistency, they remain for a long time in the viscus, they are apt to set up violent irritation accompanied by the symptoms of persistent indigestion. The occasional formation of hair-balls and other concretions in the stomach should, therefore, be considered in every etiological study of dyspepsia, as well as the existence of living creatures, such as maggots, larvæ, beetles, and other insects, which sometimes find harbourage in the organ. Lastly, it is convenient, from a clinical standpoint, to notice those types of dyspepsia which occur in infancy and old age, as well as the various functional and organic lesions of the stomach that ensue from disease of other viscera of the body. Such, then, is briefly the scheme which I shall adopt in the clinical description of that complex collection of symptoms which constitutes what is commonly known as dyspepsia or indigestion.

The Classification of Dyspepsias :

(*A*) GASTRIC INDIGESTION.

(1) *Disorders of Secretion.*

(*a*) Hyperchlorhydria or an increase of hydrochloric acid in the gastric secretion.

(*b*) Hypersecretion or continuous gastric secretion.

(*c*) Subacidity (achylia) or diminished gastric secretion.

(2) *Disorders of Motility.*

Myasthenia gastrica (atonic dyspepsia) or enfeeblement of the muscular coat of the stomach.

(3) *Disorders of the Nervous mechanism.*

(*a*) Hyperæsthesia of the stomach or exalted sensibility of the mucous membrane.

(*b*) Neurasthenia gastrica (nervous dyspepsia) or loss of nervous energy.

(*c*) Nervous eructation and regurgitation from interference with the closure of the cardiac orifice.

(4) *Dyspepsia due to Inflammation of the stomach.*

(*a*) Acute gastritis.

(*b*) Chronic gastritis.

(*c*) Atrophic gastritis.

(5) *Dyspepsia dependent upon Displacements of the stomach.*

Visceroptosis.

(6) *Dyspepsia due to the presence of Foreign Bodies and Living Creatures in the stomach.*

(7) *Dyspepsias peculiar to Infancy and Old Age.*

(8) *Dyspepsia due to Diseases of Other Organs.*

(*B*) INTESTINAL INDIGESTION.

In order to determine the proportionate frequency of the various forms of dyspepsia included in this scheme of classification, I have analysed the notes of five hundred hospital patients suffering from indigestion, who came under my notice in the course of eighteen months, and also those of an equal number of dyspeptics who consulted me privately during the same period of time, and have arranged them in the table on the following page.

The first, or hospital series, probably indicates with a fair degree of accuracy the relative frequency with which the different types of the complaint are met with in general

practice; while the second, or private series, represents the subject from the point of view of the specialist.

AN ANALYSIS OF ONE THOUSAND CASES OF DYSPEPSIA, ARRANGED ACCORDING TO THEIR CAUSE

Cause	Hospital cases		Private cases	
	Total	Per cent.	Total	Per cent.
Hyperchlorhydria . .	24	4·8	46	9·2
Hypersecretion . .	25	5	162	32·4
Myasthenia gastrica .	160	32	26	5·2
Hyperæsthesia gastrica .	51	10·2	8	1·6
Neurasthenia gastrica .	15	3	66	13·2
Acute gastritis . .	71	14·2	—	—
Chronic gastritis . .	72	14·4	62	12·4
Visceroptosis . .	15	3	88	17·6
Intestinal indigestion .	67	13·4	42	8·4
Totals . .	500	100	500	100

As might have been expected, dyspeptic conditions among the poorer classes are most frequently due to that enfeebled condition of the musculature of the alimentary tract which results from bad hygiene, exhausting occupations, and badly cooked food, or from inflammation of the stomach engendered by visceral diseases, the abuse of stimulants or exposure to cold.

On the other hand, the specialist rarely sees such forms of indigestion as hyperæsthesia and acute gastritis, which either pursue a brief course or are readily cured by treatment; while the majority of the cases that come under his notice consist of the more obscure varieties, such as hypersecretion and gastroptosis, or of those which are peculiarly intractable to treatment, like chronic gastritis and neurasthenia gastrica.

In order to formulate a scheme of *differential diagnosis*, it is necessary in the first instance to divide cases of dyspepsia into two classes, the acute and the chronic; the former of which includes those varieties that commence suddenly

and endure for a limited period of time, while the latter comprises all those which are more or less permanent in character.

The class of *acute* dyspepsias strictly speaking only includes two forms, namely, acute gastritis and acute hypersecretion ; but inasmuch as the disorder known as migraine is accompanied by very similar symptoms and is usually regarded by patients as a form of indigestion, it is permissible to include it in the same category. These three diseases have certain general symptoms in common : they all commence abruptly, pursue a definite course, and exhibit a tendency to periodic recurrence. They are all attended by more or less epigastric discomfort, nausea, vomiting, headache, anorexia, and constipation, and in each the digestive disturbance is sufficiently severe to render it a matter of grave concern to the individual affected. It may be observed, however, that while in gastritis and hypersecretion the initial symptoms are invariably referred to the stomach, *violent headache* is always the first manifestation of an attack of *migraine*. The mere history of the case will therefore permit immediate recognition of the nervous disorder. On the other hand, the symptoms of gastritis and hypersecretion are so much alike in their general characters that the most careful attention to a patient's description of his attack may fail to afford a definite clue to the nature of his malady. Examination of the vomit, however, will at once serve to distinguish acute inflammation of the stomach from acute hypersecretion. Thus, in gastritis the ejecta are scanty, alkaline in reaction, and composed entirely of tenacious mucus ; while in acute hypersecretion the vomit consists of an acid liquid tinged with bile or brown from altered blood, and which, when tested with red congo-paper, is found to contain *free hydrochloric acid*. The presence of the free mineral acid in the ejecta is pathognomonic of hypersecretion.

The principal forms of *chronic* dyspepsia are accompanied by symptoms so similar in character that at first sight it would appear almost impossible to express their differential diagnosis in a simple manner ; yet I venture to believe that, if care be taken to emphasize certain minor peculiarities, very little difficulty will be experienced in distinguishing one from another. The first point that requires attention is the time which usually elapses between the ingestion of solid food and the development of the first symptom of indigestion, since it is found that in certain disorders pain or discomfort ensues immediately after a meal, while in others it is postponed for an hour or longer. Thus, when pain or uneasiness occurs at once, the gastric mucous membrane is either hyperæsthetic or the muscular coat of the stomach is enfeebled ; the pain in the first case being due to the contact of food with the sensitive structure, while in the latter a feeling of distention and discomfort arises from the existence of gas in an otherwise empty organ.

Again, there are three varieties of dyspepsia in which the initial pain or discomfort is delayed for one hour or longer after the ingestion of solid food, namely, chronic gastritis, hyperchlorhydria, and chronic hypersecretion ; in the first-named of which flatulent distention from food decomposition is the cause of the symptom, while in the other two the existence of an abnormally acid gastric juice irritates the gastric mucosa and excites a painful spasm of the pylorus.

In a third series of cases, of which gastric neurasthenia and visceroptosis are the best examples, the dyspeptic phenomena are so irregular in their appearance and diverse in character that their mere description by the patient is usually sufficient to indicate their probable causation.

Turning now to the first class in which indigestion ensues *immediately* after a meal, it is to be noticed that, whereas almost every case of gastric hyperæsthesia is accompanied

by vomiting, this symptom is entirely absent in uncomplicated examples of myasthenia, so that it is merely necessary to inquire concerning the occurrence of emesis to distinguish at once between the two disorders.

Again, in the second class where pain or discomfort is deferred for one hour or more after a meal, the presence or absence of vomiting once more affords an important clue to the nature of the complaint, since emesis never occurs in simple hyperchlorhydria, but is a common feature of both chronic gastritis and hypersecretion. But it has already been mentioned that an examination of the vomit serves to distinguish inflammation of the stomach from continuous secretion, since in the former the ejecta are composed of alkaline mucus, while in the latter they consist of gastric juice containing *free* hydrochloric acid. Here again a differential diagnosis can be made with the greatest simplicity.

Finally, when dyspepsia is due to gastric neurasthenia or to gastroptosis, an examination of the abdomen permits the latter complaint to be recognized immediately. These various considerations can be expressed more concisely in the following manner:

THE DYSPEPSIA HAS COMMENCED IN AN ACUTE MANNER:

The disease is either Acute Gastritis, Acute Hypersecretion, or Migraine.

(1) *Severe headache* is the first symptom. Diagnosis: MIGRAINE.

(2) *Epigastric pain* or discomfort is the first symptom: Acute gastritis or hypersecretion.

(*a*) The *vomit* consists of thick, bilious, blood-stained, or colourless mucus, which is rejected at intervals after much nausea, straining, and salivation, the material being *alkaline in reaction*. Diagnosis: ACUTE GASTRITIS.

(*b*) The *vomit* is profuse, liquid, bile-stained, or brown, rejected at intervals with much epigastric pain, and followed by burning sensations behind the sternum and scalding of the throat, the material being *acid* in reaction and *containing free hydrochloric acid* (turns red congo-paper blue). Diagnosis: ACUTE HYPERSECRETION.

THE DYSPEPSIA IS CHRONIC IN CHARACTER.

(1) Pain or discomfort ensues *immediately after food:* Gastric Hyperæsthesia or Gastric Myasthenia.

(*a*) *Vomiting is a frequent symptom,* but does not afford much relief. The patient is usually a young woman, anæmic and very constipated. Milk and hot fluids occasion as much pain as solids; the entire stomach is tender on pressure, and the symptoms are rapidly removed by aperients and full doses of iron. Diagnosis: GASTRIC HYPERÆSTHESIA.

(*b*) *Vomiting is absent.* Both sexes are equally affected; liquids produce more discomfort than solids; flatulence is excessive; clapotage may be obtained during the whole period of digestion. Diagnosis: GASTRIC MYASTHENIA (ATONY).

(2) *One hour or more elapses before pain or discomfort develops:* the disorder is Chronic Gastritis, Hyperchlorhydria, or Chronic Hypersecretion.

(*a*) There is *no vomiting.* Diagnosis: HYPERCHLORHYDRIA.

(*b*) *Vomiting is a feature of the complaint:* it may be Gastritis or Hypersecretion.

(*a'*) The vomit in the early morning is sticky, scanty, and *alkaline,* while that after meals is composed of undigested food mixed with a large amount of glairy mucus from which free hydrochloric acid is absent. Diagnosis: CHRONIC GASTRITIS.

(*b'*) The vomit is profuse, liquid, *acid* to litmus-paper, and contains *free hydrochloric acid* (turns red congo-paper blue). Diagnosis: CHRONIC HYPERSECRETION.

(3) *The discomfort develops at irregular intervals,* varies in severity from day to day with the same diet, and is accompanied by numerous nervous phenomena. The *stomach is normal in size and position.* Diagnosis: GASTRIC NEURASTHENIA.

The symptoms are similar to the last, but the *stomach* is found *dislocated downward in the abdomen.* Diagnosis: GASTROPTOSIS.

CHAPTER II

DYSPEPSIA DUE TO ABNORMALITIES OF THE GASTRIC SECRETION

(1) Hyperchlorhydria. (2) Hypersecretion. (3) Achylia Gastrica

1. HYPERCHLORHYDRIA

(Synonyms—Hyperchloracidity ; Superacidity)

The term " Hyperchlorhydria " is applied to a variety of dyspepsia the principal symptoms of which are due to an excessive secretion of hydrochloric acid during the period of gastric digestion, *the phenomenon disappearing as soon as the stomach has become empty of food.*

This fact serves to distinguish the complaint from the far more serious one known as Hypersecretion, in which the excess of gastric juice is a continuous process and not limited to the periods of digestion. In this country, however, the distinction between the two disorders is seldom recognized, and the term Hyperchlorhydria is applied indiscriminately to all cases of excessive secretion ; while many continental authorities hold that simple hyperchlorhydria does not exist independently of continuous secretion. Personally, I am convinced that a large proportion of all cases of functional dyspepsia exhibit a temporary excess of gastric juice during digestion which is susceptible of cure ; and although this periodic disorder may gradually merge into the continuous variety, it merits recognition as a separate clinical entity.

Frequency.—Owing to the fact that a systematic analysis

of the gastric contents in cases of dyspepsia is rarely performed either in private or hospital practice, it is almost impossible to obtain any reliable information concerning the frequency of the disorder, and most writers content themselves with the statement that it is a common complaint. According to most German authorities, hyperchlorhydria exists in about one-half of all persons who suffer from functional disturbances of digestion, but Jaworski states that it existed in 75 per cent. of his patients who had diseases of the stomach. In France, Mathieu and Rémond noted its existence in about 30 per cent. of the cases of dyspepsia which they examined, and Bouveret in 25 per cent. of those that came under his immediate care. Einhorn, of New York, states that it was present in 286 out of 564 cases of indigestion, or in more than 50 per cent.; but in London it would seem that the complaint is much less frequent, since it was observed in 9·2 per cent. of my private cases and in 4·8 per cent. of those examined in hospital practice. Of recent years, and more especially since the war, secretory disorders of the stomach have greatly increased in frequency, and I find from my private statistics during the last eight years that more than 60 per cent. of all cases of dyspepsia suffered from either simple hyperchlorhydria or hypersecretion.

Etiology.—An excessive secretion of hydrochloric acid during the period of digestion occurs under many and diverse conditions. Thus, it may ensue from direct stimulation of the mucous membrane of the stomach or from irritation of a neighbouring or even remotely situated organ. It is a frequent accompaniment of gastric ulcer and gastroptosis, and is occasionally met with in other functional and organic lesions of the stomach, while in many diseases of the central nervous system the severity of the secondary hyperchlorhydria may distract attention from the more important primary trouble. It is, therefore, convenient

to distinguish between a primary and a secondary variety according as the complaint appears as a simple functional derangement of the stomach or a complication of a more serious affection either of that viscus or some other organ of the body.

Primary Hyperchlorhydria.—The most frequent cause of the primary variety is to be found in a prolonged and excessive stimulation of the gastric mucous membrane by the ingesta. The introduction into the stomach of a large quantity of nitrogenous food induces in a healthy individual a secretion of gastric juice sufficiently abundant to meet the demands made upon the digestive capabilities of the organ, the larger the meal the more profuse and potent being the gastric secretion. It consequently happens that persons who habitually indulge in abnormal quantities of rich food educate their stomachs to produce at each meal a secretion which is not only unduly abundant, but which is also particularly rich in hydrochloric acid. So long as the supply of food continues, this inordinate activity of the stomach rarely produces any ill effects; but if from any cause the diet is suddenly restricted, the excess of free hydrochloric acid at once makes itself felt by pain, pyrosis, and other symptoms of indigestion. It is for this reason that so many *bons vivants* suffer from "acid" dyspepsia, when, owing to an attack of gout or other disease, they are obliged to confine themselves to a limited dietary.

In other instances it is the *quality* rather than the quantity of the food which is responsible for the over-excitation of the gastric glands. Thus, in many cases the hyperacidity can be traced to indulgence in condiments, spices, coffee, wines, beer, liqueurs, tea, sweets, liver, bacon, or salt fish; while in certain individuals a strong cigar or an excess of tobacco, a few doses of gentian, quinine, quassia, nux vomica, iodide of potassium, sandalwood oil, or even a mercurial pill, invariably produces an attack of the disorder.

Insufficient mastication of ordinary food, whether it be from carelessness or absence of teeth, is another common cause of hyperchlorhydria, while among the poorer classes inefficient cooking, coarse bread, oatmeal, and excess of hard vegetables are often the exciting agents of the complaint. According to my experience, vegetarians are especially prone to suffer from this variety of indigestion after middle age.

All authorities are agreed that a hyperacid secretion of the stomach is often due to functional disorders of the central nervous system, and is common in families which possess an inherited tendency to mental disease, hysteria, or epilepsy. The subjects of neurasthenia are particularly prone to chronic hyperchloracidity, and von Noorden has noted its prevalence in cases of melancholia. Psychic influences are often the exciting cause of an attack in nervous individuals, a sudden emotion such as worry, anger, or excitement, being at once followed by the symptoms of the gastric disorder. Finally, any condition which tends to exhaust the nervous system, such as insufficient food, bad ventilation, a residence in an atmosphere which is constantly illuminated by gas, masturbation, venereal excesses, bleeding piles, epistaxis, menorrhagia, or even profuse leucorrhœa, are frequent though often unsuspected causes of chronic hyperchlorhydria in early life.

Secondary hyperchlorhydria is somewhat less common than the primary form. It exists in more than one-half of all cases of chronic simple ulcer of the stomach and duodenum, and is especially common when the ulcer is situated in the immediate vicinity of the pylorus. It is occasionally, though rarely, met with in cancer and sarcoma of the same region. Chronic irritation in other abdominal organs may also be accompanied by hyperacidity of the gastric secretion, which is therefore by no means infrequent in persons suffering from floating kidneys, displaced or inflamed ovaries, ovarian

tumours that are liable to torsion of their pedicles, retroverted uterus, chronic perimetritis, and certain spasmodic affections of the colon. The subjects of gall-stones are particularly prone to this variety of dyspepsia, and during an attack of biliary colic, will often vomit gastric juice that contains an abnormally high percentage of free hydrochloric acid. A similar phenomenon is sometimes observed during the passage of a renal or pancreatic calculus. Removal of an appendix is always followed for a week or ten days by a marked increase of the gastric secretion. It is the custom to-day to ascribe hyperchlorhydria, as well as almost every other variety of indigestion, to pyorrhœa; but in my experience bad teeth, with or without suppuration, never give rise to excessive secretion of hydrochloric acid.

Jaundice due to obstruction of the common bile-duct is usually associated with the symptoms of dyspepsia and occasionally with hyperchlorhydria. This fact is corroborated to some extent by the experiments of Smitzky, who found that ligature of the bile-duct in dogs was followed by an excessive secretion of hydrochloric acid, which disappeared when the jaundice subsided.

German writers affirm that chlorosis is constantly accompanied by hyperchloracidity, and, according to Oswald, 85 per cent. of the subjects of chlorosis in Riegel's clinic suffered from hyperchlorhydria. In this country, however, the association of the two disorders is much less common, and most of the anæmic girls who come under medical treatment for dyspepsia suffer either from myasthenia of the stomach and bowel or from gastric hyperæsthesia.

Organic as well as functional diseases of the brain and spinal cord are occasionally attended by hyperchlorhydria. Cerebral tumour, chronic cerebritis, disseminated sclerosis, chronic myelitis, and locomotor ataxia are especially apt to be complicated by the gastric disorder, while attacks of migraine and hystero-epilepsy are occasionally preceded

by the vomiting of an abnormally acid gastric juice. Finally, it may be noted that a causal connexion exists between hyperchlorhydria and malaria, and that the recurrent attacks of the latter are sometimes replaced by severe cardialgia accompanied by an excessive secretion of hydrochloric acid.

The primary form is more frequent in men than women, and is most commonly met with between thirty and fifty years of age, the average age at which the disorder commenced in my series of cases being forty-three years. Heredity undoubtedly plays an important part in its etiology, since the disorder is particularly common in certain families, every member of which will sometimes develop it about middle life. According to Fleischer, the inhabitants of Hessia are unduly prone to suffer from this disorder of the stomach, and Jaworski noted its inordinate frequency among the natives of Poland. In England the complaint is most often encountered in damp and low-lying districts, along the southern and western coasts, and in towns whose water supply is derived from a chalky soil. It is far more common among the upper classes of society than among the poor, and, according to my statistics, is twice as frequent in private practice as among persons who attend the out-patient department of a hospital. It is especially apt to attack those engaged in occupations which involve severe mental strain or who suffer continually from domestic, financial, or business worries. Jews are more liable to it than any other class of the community.

Symptoms.—Hyperchlorhydria usually commences in an insidious manner, and many weeks or even months may elapse before its characteristic phenomena become fully developed. Occasionally, however, they appear quite abruptly during perfect health and, after continuing severe for a week or two, either disappear completely or gradually lessen in severity and assume a chronic form.

Pain.—This constitutes the most frequent and prominent symptom of the disorder, and although it may vary considerably in intensity in different cases and in the same case at different times, it always presents certain features which serve to distinguish it from that met with in other varieties of dyspepsia.

At an early stage of the malady discomfort rather than actual pain is the rule, and the patient chiefly complains of a feeling of pressure, heat, or burning in the epigastrium, which culminates in the expulsion of wind or slight acid eructations. In the course of time these subjective phenomena increase in severity until they merge into actual pain. When this stage has been reached, pain ensues during each period of digestion and usually from one to three hours after the meal. Thus, if breakfast be taken at 8.30 a.m., the epigastric discomfort is usually felt about 10 a.m. and the crisis of the attack is reached about 11 o'clock ; while a lunch at 1.30 p.m. is followed by pain from 3 to 4 o'clock, and a dinner at 7.30 p.m. by pain at 9.30 to 11 p.m. As a rule, the morning attack is the slightest and that of the afternoon the most severe ; but those persons who make their principal meal in the evening usually suffer most at night. It is also to be observed that the character of the food and the amount that is taken exert an important influence upon the time at which the pain occurs ; the more abundant the meal and the greater the proportion of nitrogenous matter it contains, the later the development of the symptom ; while a small meal, or one composed chiefly of farinaceous substances or vegetables, is often followed by pain within an hour. As a rule, the pain is referred at its commencement to the epigastrium, but subsequently it radiates over the whole of the upper abdomen and lower part of the chest, round the left hypochondrium to the back, and is often severe in the region of the dorsal spine. In some cases the precordial region is principally affected, and

much difficulty may be experienced in distinguishing the condition from angina pectoris; while occasionally the paroxysm appears to be located over the site of the gall-bladder, and closely resembles an attack of biliary colic. When hyperchlorhydria accompanies gastroptosis the pain is often referred to the right iliac region, and may consequently suggest renal colic or appendicitis. During the height of an attack the face is expressive of the greatest agony, and the patient often rolls upon the floor or reclines over the back of a chair in his endeavours to obtain some relief from his intolerable suffering. Chilliness or shivering is sometimes complained of, and profuse perspirations are apt to occur; but the temperature of the body is never elevated, and the pulse is usually slow, regular, and of low tension. Occasionally a patient will describe a peculiar sensation of movement or "jumping" of the stomach, as though the organ was undergoing a series of spasmodic contractions. The climax of the attack is usually heralded by the belching of gas and the regurgitation of mouthfuls of acid fluid, which gives rise to a cramping pain behind the sternum and scalding of the throat and mouth, after which the symptoms gradually subside and are replaced by soreness and tenderness of the epigastric and hypochondriac regions. In some instances there is profuse salivation. Occasionally vomiting occurs and is followed by an immediate remission of the symptoms. These violent attacks do not exhibit any strict periodicity of recurrence, but develop at irregular intervals during the course of the disease, and often appear to be excited by some special article of diet or by a severe mental emotion. The milder paroxysms usually last from twenty to forty minutes and completely subside before the next meal, but the more violent may persist for several hours and be accompanied by severe headache.

Many patients lay great stress upon the fact that the pain only occurs when the stomach is empty, although they will

admit that they never suffer in this respect in the early morning before breakfast, when the organ is really devoid of food. This statement must, therefore, be understood to imply that the pain usually develops towards the termination of gastric digestion and consequently at a time when the stomach is popularly supposed to be empty. Cases in which the pain is thus deferred for several hours also exhibit another quite characteristic though apparently anomalous feature, namely, that the symptom is immediately relieved by the ingestion of proteid food. The explanation of this phenomenon is to be found in the strong chemical affinity that exists between free hydrochloric acid and albumin, the compound formed when the two are brought into contact being of considerable stability and not endowed either with the digestive or irritant properties of the uncombined mineral acid. A draught of water also affords relief by diluting the acid contents of the organ, while a dose of bicarbonate of sodium or other alkali proves still more effective by neutralizing the free acid.

The painful sensations which arise from hyperchloracidity are probably due to several causes. An excess of free acid appears to increase the peristaltic movements of the stomach and at the same time to induce spasm of the pyloric and cardiac sphincters, the combined effects of which augment the intragastric pressure and produce subjective sensations of weight, fullness, and distention. The cardiac sphincter, being the weaker of the two, usually yields first, when a copious eructation of gas occurs and immediate relief is experienced. It is only in rare instances that relaxation of the pylorus precedes that of the cardia, and in such a sudden, general distention of the abdomen accompanied by griping pains, the passage of flatus, and sometimes by a loose action of the bowel, replace the previous gastric symptoms. There is reason to believe that in chronic cases the continued overaction of the pyloric muscle leads to

hypertrophy of its tissue, and that the violent pain which sometimes occurs at the crisis of an attack is due in great measure to a tetanic contraction of this enlarged and powerful muscle. But, apart from these considerations, it is quite certain that an increased sensibility of the whole of the gastric mucosa must exist in most cases of chronic hyperchlorhydria and play by no means an unimportant part in the production of the gastric pain. Thus, many cases have been recorded in which persistent hyperacidity was not accompanied by any abnormal symptoms, and I have often found after the administration of a test-meal to persons who had never suffered from indigestion, that the total acidity of the filtrate varied from 75 to 90 with a notable increase in the amount of free hydrochloric acid. On the other hand, it is a still more common experience that in very chronic cases of hyperchlorhydria the total acidity as well as the percentage of free acid gradually falls until a condition of subacidity is attained, while at the same time the painful sensations experienced during the periods of digestion are increased rather than diminished, and even the administration of bicarbonate of sodium seems further to exaggerate the suffering. Lastly, in every case of this nature in which I have seen the stomach opened with the view of discovering an organic cause for the severe symptoms, the mucous membrane was purple in colour, much swollen, and covered with numerous superficial hæmorrhages or erosions, while microscopical examination of a small portion that was removed showed severe interstitial gastritis of the kind that is artificially produced by the application of chemical irritants. I have, therefore, very little doubt that the susceptibility of the stomach to free hydrochloric acid varies considerably in different individuals, and that many persons are able to endure without discomfort a degree of acidity which in others invariably provokes severe symptoms. Further, that while hyperæs-

thesia of the gastric mucosa always exists in cases of hyperacidity, long-continued irritation excites a severe diffuse gastritis which renders the organ intolerable of any degree of acidity, of strong alkalies, or even of food.

Vomiting rarely occurs spontaneously in uncomplicated cases, but the patient will often insert his fingers down the throat or adopt some other means of emptying the stomach in order to secure the relief that invariably follows an evacuation of the organ. *Flatulence* is always present, and in mild cases constitutes the principal symptom of the complaint. As a rule, one hour or more elapses between the ingestion of food and the development of epigastric distention and gaseous eructations. *Acidity* is also a common cause of complaint and takes the form of regurgitations of an extremely sour fluid, accompanied by a scalding or cramping pain behind the sternum and in the throat. Occasionally the pyrosis is replaced by severe aching in the muscles of the neck and in the region of the submaxillary glands, or by pain in the lower jaw and the teeth. As a rule, the *appetite* remains unimpaired throughout the whole course of the malady and is often markedly increased. In other cases a curious sense of emptiness or sinking is experienced in the epigastrium one hour or more after a meal, which only recourse to milk or other nitrogenous food will allay, or an insatiable craving exists for meat, accompanied, perhaps, by a distaste for fat, oils, and butter. Apart from the habit so often acquired of indulging in draughts of cold water with the view of relieving pain, actual thirst is rarely a symptom of the disorder. Constipation almost invariably exists, and the evacuation of a hard scybalous stool is sometimes followed by much itching of the anus. In chronic cases attacks of diarrhœa are apt to supervene from time to time, when small motions mixed with much slimy mucus are voided. The *general nutrition* is wonderfully well preserved, and even in severe cases the patient

rarely loses flesh or presents the careworn, anæmic appearance usually met with in other painful diseases of the stomach. The *tongue* remains red, clean, and moist; the teeth are apt to undergo rapid decay, and small superficial ulcers occur from time to time upon the gums and lips. Hyperacidity of the gastric juice is always accompanied by a corresponding reduction in the acidity of the urine, which after meals is often alkaline in reaction and deposits phosphates on standing. According to Sticker, the output of chlorides is diminished.

Physical Signs.—External examination of the stomach rarely reveals any abnormal signs. In uncomplicated cases the organ presents no indications of enlargement, nor can any localized tenderness be discovered by palpation. During an attack of severe pain, however, the whole of the gastric region is distended and extremely sensitive to pressure, especially over the site of the pylorus, and occasionally an intermittent increase of resistance over the fundus suggests the existence of an excessive peristalsis.

The passage of a soft tube into the stomach and a chemical analysis of the material extracted is the only method by which a positive diagnosis of hyperacidity can be made and its severity be estimated. In the early morning before any food or drink has been taken, the stomach is found to be either entirely empty or at most to contain a few cubic centimetres of an alkaline and slightly opalescent fluid: a result which serves at once to distinguish hyperchlorhydria from hypersecretion, in which latter complaint the fasting stomach always contains a notable amount of gastric juice. A test-breakfast, consisting of about 2½ ozs. of soft bread and 12 fl. ozs. of weak tea, with sugar and milk, is then administered, and the stomach is again evacuated at the end of an hour. On examination, the filtered chyme gives the usual colour reactions indicative of free hydrochloric acid, and, when triturated with the decinormal solu-

tion of soda, the total acidity is found to exceed the normal (55–60) and often amounts to 85, while the amount of hydrochloric acid in a free state varies between 0·04 and 0·08 per cent. As a rule, the proteid-acid exhibits a corresponding degree of increase.

The filtered fluid also contains albumin in various forms, such as syntonin, propeptone, and peptone, and the biuret reaction is usually very pronounced. Lactic and butyric acids are absent, and when exposed to the air the fluids resist putrefaction for several days. It may also be determined that the material is capable of digesting discs of egg albumin when maintained at a temperature of about 70° F. and will curdle milk after neutralization.

As might be expected from the abnormal activity of the gastric secretion, the processes of digestion are more rapid than under ordinary circumstances, and the material left upon the filter displays that fine subdivision and transparency of its constituent particles which are always indicative of active digestion. Absorption from the stomach is not disturbed in uncomplicated cases, and if the iodide of potassium test be employed, the salt may be detected in the saliva within ten minutes or, according to some authorities, even sooner. During the earlier stages of the complaint the excess of free acid in the gastric secretion appears to stimulate the muscular tunic, with the result that the organ empties itself with unusual rapidity, as may be observed on the X-ray screen after a bismuth meal. If the salol test be applied, salicylic acid appears in the urine one hour and a half after the administration of the salt. In very chronic cases, on the other hand, gastric myasthenia usually exists, and if hypersecretion complicates the original disorder, dilatation of the stomach is always present.

Clinical Varieties.—At its commencement simple hyperchlorhydria is usually intermittent in character, and after

an attack has lasted for a few weeks, the symptoms disappear for some time. In many instances the development and subsidence of the complaint appear inexplicable to the patient, but, as a rule, its recrudescence is attributable either to an indiscretion of diet, excitement, fatigue, or to exposure to cold. The disorder may persist in this intermittent form throughout the patient's entire life.

More frequently the attacks tend to succeed each other at shorter intervals, to be excited more readily, and to prove more refractory to treatment, until the patient suffers from a chronic form of indigestion with frequent intercurrent attacks of a more acute nature. It is worthy of notice, however, that an examination of the contents of the stomach during a period of apparent remission almost invariably indicates that the secretion of hydrochloric acid is in excess of the normal.

In other instances, again, the gastric attacks are replaced from time to time by symptoms akin to those of migraine, and violent headache, lasting for several hours, and sometimes terminating by vomiting, develops at irregular intervals and causes great prostration. In such cases the contents of the stomach during an attack always exhibit a large excess of free hydrochloric acid.

Lastly, all authorities are agreed that chronic hyperchlorhydria is very apt to be complicated by hypersecretion, the intermittent flow of gastric juice gradually giving place to continuous secretion. At first the hypersecretion, like its forerunner, is usually intermittent, but eventually it assumes a chronic character and is then attended by the various signs and symptoms characteristic of that disorder. Very rarely multiple erosions of the gastric mucous membrane occur and give rise to slight hæmatemesis or melæna (Oestreich).

Prognosis.—Uncomplicated hyperchlorhydria, when properly treated at an early stage, is usually susceptible of cure.

The chronic form of the disease, however, is much more intractable and undergoes frequent relapses, but its principal symptoms may be relieved by the adoption of a strict diet and other remedial measures. When the disease is complicated by dilatation of the stomach, the prognosis is much less favourable, since it is apt to be followed by continuous secretion of gastric juice. If the hyperchloracidity is secondary to organic disease of the nervous system, ulcer of the stomach, cholelithiasis, etc., the prognosis will depend upon that of the primary complaint.

Diagnosis.—When the symptoms of hyperchlorhydria are very pronounced, the history of the case affords a strong indication of the nature of the malady. Thus, the onset of epigastric pain one or two hours after a meal, accompanied by flatulence and acidity ; the relief that is afforded by a dose of alkaline medicine, or even by a glass of milk or other proteid food ; the periodic recurrence of the symptoms and their augmentation by certain articles of diet, fatigue, or excitement are facts that must invariably suggest an hyperacid gastric juice. On the other hand, a positive diagnosis can only be made by careful exploration of the stomach after a test-meal, and the determination thereby of an excess of hydrochloric acid in its secretion, which disappears in the intervals of digestion.

In cases of *chronic hypersecretion*, epigastric pain of the same character and periodicity of recurrence is encountered, but the most severe attack usually occurs at night rather than in the afternoon and frequently terminates by vomiting. Dilatation of the stomach is as common in this disease as it is exceptional in simple hyperchlorhydria, the appetite is diminished, thirst is usually excessive, and the patient becomes emaciated, feeble, and despondent. Exploration of the stomach with a tube in the early morning shows that it contains a notable quantity of fluid rich in free hydrochloric acid and pepsin, even though the organ had been

carefully washed out overnight and no food had been taken in the interval.

Ulcer of the stomach is often difficult to distinguish from primary hyperchlorhydria, both on account of the similarity of its symptoms and also from the fact that it is commonly associated with an excessive secretion of acid. It may be noticed, however, that the pain of a simple ulcer usually develops within half an hour of a meal, tenderness on pressure is localized strictly to the epigastrium, while vomiting is comparatively frequent and affords immediate relief. In hyperchlorhydria, on the other hand, painful sensations are deferred for one or two hours after a meal, the whole area of the stomach is tender, and vomiting is never encountered. Moreover, a continuous secretion of gastric juice rather than simple hyperchloracidity usually accompanies ulceration of the stomach, and consequently the organ is found to contain the characteristic acid fluid both in the early morning and at other times when it should be quite empty. Hæmorrhage is a rare complication of simple hyperchlorhydria, and when it does occur the loss of blood is slight; while that which ensues from true ulceration is always copious and is followed by melæna.

Radiography often affords confirmatory evidence of ulceration.

Biliary colic may easily be confused with the painful crises of hyperchlorhydria, since in both complaints the symptoms and signs of hyperacidity exist and the pain and tenderness are situated in the region of the gall-bladder. Biliary colic, however, rarely exhibits the periodicity of recurrence met with in hyperchlorhydria, and its incidence is not confined to the periods of gastric digestion. Its onset is more sudden, its character more severe, and its duration longer than the pain of the functional complaint; while in many instances the supervention of jaundice with enlargement and tenderness of the gall-bladder affords an unmis-

takable indication of the nature of the malady. The connexion between cholelithiasis and hypersecretion will be discussed in the next chapter.

Hyperæsthesia of the stomach is accompanied by severe pain after food and also occasionally by hyperchloracidity. The subjects of this complaint, however, are usually young and anæmic women; the pain ensues immediately after a meal and is never deferred for more than half an hour; vomiting is a frequent symptom, but only partially relieves the pain, and little or no relief is afforded by a milk diet. The administration of bicarbonate of sodium has no effect, and recourse to more food increases rather than diminishes the trouble. On the other hand, full doses of iron with a suitable aperient soon remove the hyperæsthetic condition of the gastric mucosa; while similar treatment in a case of hyperchlorhydria usually increases the pain and excites vomiting. Attacks of *gastralgia* sometimes occur in the subjects of hysteria and neurasthenia, and if associated with flatulence and other symptoms of indigestion, may be mistaken for the painful crises of hyperchlorhydria. As a rule, however, true gastralgia develops independently of food, is much more severe, less easily relieved, and is not accompanied by tenderness of the abdomen, while the gastric secretion never exhibits any decided increase of free hydrochloric acid. The "gastric crises" of locomotor ataxia are occasionally accompanied by the vomiting of a hyperacid fluid, but the absence of the knee-jerks, and the existence of the usual signs of the spinal complaint are sufficient to indicate the cause of the gastric phenomena.

Treatment.—*General.*—The first object in the treatment of the disease is to avoid everything which tends to excite the glandular activity of the stomach. If the hyperchlorhydria appears to arise from mental exertion, emotional excitement, or physical overstrain, these conditions must be obviated as far as possible. During an acute phase of

the malady complete rest should be enforced, and the patient should remain in bed or on a sofa for a few days. Climate always exercises an important influence upon the severity of the symptoms, and in many cases exposure to cold or damp will invariably provoke an attack. Residence in an enervating atmosphere usually increases the disorder, and hence all low-lying districts, the Isle of Wight, Devonshire, and the south-west of England, are unsuitable for persons affected with chronic hyperacidity. As a rule, inland health resorts are preferable to those situated on the coast, and especially Malvern, Ilkley, Hindhead, the north of Scotland, and the elevated parts of Sussex and Bucks. In all cases the patient should be advised to wear warm underclothing, with a woollen or chamois-leather belt next the skin, and should be warned against the use of cold baths in the winter or prolonged immersion in the sea.

Everything which tends to increase the secretion of hydrochloric acid must be avoided, and if the teeth are in bad condition they should receive immediate attention. Nuts, fruits, salads, and other substances difficult of solution by the gastric juice must be prohibited, as well as such stimulating articles as pepper, mustard, vinegar, horseradish, alcoholic beverages, and beer. Tea always increases the acidity, and coffee is inadvisable in the majority of cases. Moderate smoking need not be prohibited, but strong tobacco as well as cigars must be avoided, and the habit should never be indulged in when the stomach is empty.

Diet.—The chemistry of digestion in hyperchlorhydria demonstrates in an unmistakable manner that, while nitrogenous foods are rapidly dissolved and passed into the intestine, starches, and in many cases fats, lie stagnant in the stomach and undergo fermentation. Pawlow has also shown by experiment that the different forms of proteid food excite varying degrees of acidity, the most potent in this respect being beef and mutton, while milk not only

induces the least secretion, but also fixes the greatest proportion of free hydrochloric acid. Lastly, clinical experience teaches that starchy substances give rise to more discomfort than proteids, and milk to less than meat. In every case, therefore, milk should constitute the staple diet during an acute attack of the disorder, care being taken to administer it in such form as will prove most agreeable and beneficial to the patient. At first, six ounces of warm milk containing a tablespoonful of lime-water should be given every two hours and after a few days the dose may be increased to half a pint or more every two and a half hours. Some patients prefer the milk to be mixed with Vichy water or soda water, while others find that the addition of 15 grains of citrate of sodium to each half-pint prevents the discomfort that sometimes ensues from its rapid coagulation in the stomach. Peptonization is, of course, unnecessary, and milk curdled by means of lactobacilline never agrees. In exceptional cases it may be advisable to restrict the patient entirely to whey until the irritability of the stomach has subsided. Junket and koumiss answer very well in some instances. As soon as the acute symptoms have subsided, the milk may be thickened with fine oatmeal, sago, or ground rice, after which poached and boiled eggs, chicken cream, boiled fish rubbed through a sieve, and cold boiled bacon may be allowed. Wheaten bread and toast always give rise to discomfort and should be replaced by rusks or the Brusson-Jeune rolls. Sole, whiting, plaice, and cod usually agree better than the more oily forms of fish, and should be well boiled or steamed, finely minced, and served with plain sauce. Subsequently, poultry, game, the various red meats, tongue, sweetbreads, tripe, and ham may be allowed, with a small quantity of boiled or mashed potato, cauliflower, seakale or asparagus. On the other hand, cabbage, lettuce, beetroot, peas, beans, celery, carrots, and turnips never agree, and no fruit or nuts should be permitted.

Although starchy foods tend to increase the secretion of hydrochloric acid, the soluble sugars do not appear to do so, and, according to Strauss, a considerable amount of dextrose in solution may be given each day without producing any disturbance of the digestion, provided that the motor power of the stomach is perfect.

A moderate amount of fat may also be included in the dietary, especially in the form of butter and cream, but fried bacon is apt to give rise to acidity. Salt should be avoided as far as possible.

The frequency of the meals must vary in different cases. If the appetite is normal it is advisable to allow only three full meals during the course of the day, so as to give the stomach definite periods of rest; but when hunger is a marked feature of the case or the patient finds that his desire for food is easily satisfied, it is better to administer a smaller quantity of food every three hours.

A moderate amount of fluid may be taken at the end of a meal as it helps to dilute the acid secretion, and for this purpose warm water, or water containing bicarbonate of potassium in the proportion of 1 grain to the ounce, is particularly valuable, or one of the natural alkaline waters, such as those of Vichy, Ems, Seltzer, or Contrexéville, either alone or mixed with milk, may be prescribed. Kéfir sometimes agrees well, and cider has been recommended by some authorities, but, as a rule, acid fluids tend to increase the pain and discomfort. Spirits and beers always augment the acidity, but if it is necessary to administer alcohol a light white wine well diluted with water is perhaps less harmful than the other varieties of stimulants.

Medicinal.—In mild cases or at the commencement of an attack the patient may be directed to suck two or three compound bismuth lozenges after meals or to swallow three of the 5-grain tabloids of bicarbonate of sodium. As a rule, however, a more active course of treatment is required

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in which the exhibition of alkalies plays the most important part. The majority of practitioners prefer the bicarbonate of sodium either alone or in combination with calcined magnesia, but some employ the solution of potash, biborate of sodium, peroxide of magnesia or alumina, or prepared chalk to neutralize the excess of acid in the stomach. Whichever drug is used, it should be given in full doses about two hours after a meal. In severe cases a sedative is always required, and 10 minims of the solution of morphine or a grain of the phosphate of codeine may be added to the alkaline mixture. Belladonna has been recommended on account of its supposititious inhibitive influence upon the gastric secretion (Penzoldt), but neither it nor atropine really diminishes the acidity, and not infrequently induces vomiting.

When the pain is severe and only partially relieved by alkalies, it is safe to assume that the symptom is due in great part to a hyperæsthesia of the gastric mucous membrane induced by irritation of free hydrochloric acid, and under these circumstances the salts of bismuth are invaluable. As a rule, the carbonate, in doses of 15 to 20 grains, is the best preparation, especially when combined with morphine and glycerin, but the solution of bismuth prescribed with the elixir of chloretone or carbolic acid is often of considerable value. In very obstinate cases nitrate of silver has been recommended either in the form of a pill or as a gastric douche (1 in 1,000), but I have never known a case in which any permanent benefit was derived from the employment of this salt.

The constipation which almost invariably accompanies hyperacidity should be combated in the first instance by saline aperients administered in the early morning. Phosphate of sodium (2 drachms), the artificial Carlsbad salts (2 to 4 drachms), sulphate of sodium (2 drachms), or Rochelle salt (2 to 4 drachms) may be given dissolved in a tumbler-

ful of hot water, or recourse may be had to such natural mineral waters as those of Carlsbad, Friedrichshall, Hunyadi János, or Apenta. As the case improves the quantity is gradually reduced, and finally the saline is omitted in favour of an occasional dose of aloes and rhubarb, mercury and colocynth, or some other simple aperient.

Lavage is indicated only when gastrectasis complicates the functional disorder. Some writers assert that internal galvanization of the stomach reduces the secretion of hydrochloric acid and is capable of curing the complaint. That the acidity does occasionally diminish under this method of treatment cannot be doubted, but I have never met with a case in which a genuine cure had been effected by means of electricity. Hot-air baths have been recommended by Simon as a means of controlling the hyperacidity, and considerable relief is often experienced after copious perspiration has taken place, but unfortunately the improvement is only temporary and the symptoms reappear after a few hours.

2. HYPERSECRETION

(Synonyms—Continuous Secretion of Gastric Juice; Gastrosuccorrhœa; Disease of Reichmann)

The disorder of digestion which is commonly termed "hypersecretion" is distinguished from all other forms of dyspepsia by the fact that the secretion of gastric juice occurs in the intervals as well as during the periods of gastric digestion, and is therefore practically continuous. This morbid condition is usually regarded as a permanent one, and it is consequently taught that, like other chronic diseases, it always commences in an insidious manner and pursues an uninterrupted course. Many observations, however, have been recorded which tend to prove that a continuous secretion of gastric juice may occur at irregular

intervals and persist for a comparatively short time, while the chronic disorder itself not infrequently develops as a sequela of this paroxysmal form of the complaint. It is, therefore, convenient to recognize two clinical varieties of hypersecretion, namely, the *intermittent* and the *chronic*.

Acute or Intermittent Hypersecretion

Very little is known concerning the etiology of this complaint. According to Reichmann, it is chiefly encountered in young persons of a nervous, active, and excitable disposition, and especially in such as have inherited a tendency to some neurosis. The disorder, however, may appear at any age and may recur until an advanced period of life. Over-excitement and cerebral fatigue often appear to be responsible for an attack, while in not a few instances an unusually heavy meal or the ingestion of some special article of diet is followed immediately by the symptoms of the complaint. Thus, in certain individuals, a draught of iced beer or water, a strong cigar, or indulgence in smoked fish, bacon, calf's liver, cider, spirits, or stone fruit are particularly injurious, while in others some temporary indisposition, such as influenza, tonsillitis, a bout of intemperance, or even a severe chill, is sufficient to provoke a seizure. Some writers have asserted that the gastric crises of locomotor ataxia are due to intermittent hypersecretion, and Sahli has reported an instance in which the two conditions appeared to be intimately connected; but, as a rule, no evidence of a continuous secretion of gastric juice can be demonstrated during the course of the spinal complaint. On the other hand, in certain cases of cerebral tumour the localizing symptoms of the lesion may be preceded for several months by recurrent attacks of hypersecretion, accompanied by violent headache, which are very apt to be mistaken for seizures of the so-called "bilious" type and thus to lead to a serious error of diagnosis. In the female an attack

of hypersecretion sometimes precedes or follows the menstrual periods, especially if there be dysmenorrhœa or disease of the ovaries or appendages. Personally, I believe that intermittent hypersecretion is merely an early phase of the chronic disorder and is always due to an organic lesion of the digestive organs. In three cases of this description that were submitted to operation after suffering from two attacks, each of about a fortnight's duration, a chronic ulcer of the duodenum was found to exist.

Symptoms.—An attack usually develops quite suddenly during a period of apparently good health. In the early hours of the morning the patient's rest is disturbed by dreams, and he awakes with a sense of ill-defined discomfort or a feeling of oppression at the chest. Within a short time the disturbance becomes localized to the upper part of the abdomen, which grows distended and tender; belching of gas and regurgitations of an acid fluid are followed by a severe and often spasmodic form of pain, and finally vomiting ensues which affords relief.

At first the ejecta consist of partially digested food, but after the emesis has been repeated once or twice the material is found to be composed almost entirely of a yellow or green, sour-smelling fluid, which gives an acid reaction with litmus-paper and contains both free hydrochloric acid and the peptic ferment. The total acidity varies between 40 and 60, but, except in the specimens which are mixed with food, the percentage of free hydrochloric acid rarely exceeds the normal. The vomiting continues to recur at intervals, preceded by severe nausea, and during the attack 3 pints or more of bile-stained gastric juice may be rejected, although neither food nor liquid has been introduced into the stomach. Mucus is usually present in moderate quantity, and occasionally a coffee-ground appearance of the vomit indicates the existence of hæmorrhagic erosions. Great thirst is experienced during the attack, but draughts

of water almost always excite nausea and vomiting. The appetite is completely lost, the pulse is small and quick, and the temperature of the body is depressed. Constipation is invariably present. In many instances great restlessness is exhibited, and the patient continually tosses about in his bed, and may even exhibit slight delirium. In certain cases, and especially in young people, the attack is ushered in by severe headache, which is increased by any movement of the body and is only relieved by the vomiting of the acid contents of the stomach. Photophobia, with congestion of the conjunctivæ and lachrymation, and even transient diplopia, may occur at the commencement of the disease. A condition very similar in its general characters to this was described by Rossbach in 1884, under the title of " Gastroxnysis " ; by Lepine in 1885, by that of " Gastroxie " ; by Rosenthal in 1887; and by the writer in his work on *Disorders of Digestion in Childhood*, under the term " Paroxysmal Hyperacidity." In all these cases the cephalalgia appears to be directly connected with the excessive secretion of acid, since it is immediately relieved when the gastric contents are neutralized by the introduction of an alkali or removed by evacuation of the stomach.

During the early stages of the disorder the tongue is moist and red ; but it soon becomes covered with a creamy-white fur, and in severe cases may eventually be dry, brown, and cracked. The urine is greatly reduced in amount and presents an abnormally high colour. The output of chlorides is much diminished owing to the enforced abstinence from food and the vomiting of large quantities of hydrochloric acid. The excretion of urea is also notably diminished. Occasionally the urine presents a peculiar glistening appearance due to the presence of a vast number of uric acid crystals, and this phenomenon usually indicates the proximity of the crisis. During the attack a loss of weight varying from 3 to 9 lb. usually occurs.

The duration of an attack varies considerably in different cases, in some the symptoms only lasting for a few hours, while in others they endure for several weeks with occasional remissions. As a rule, the shorter seizures are accompanied by the most severe symptoms, while in the more prolonged cases severe pain is only experienced immediately prior to vomiting, and is relieved as soon as the stomach has been evacuated. The pain itself is chiefly referred to the region of the pylorus, whence it radiates over the abdomen, chest, and back. Its sudden cessation is often accompanied by gurgling and by a feeling that an internal spasm has suddenly relaxed, while its more gradual subsidence is frequently attended by the expulsion of gas by the bowel or polyuria. Occasionally the gastric intolerance becomes complete, when not only is every effort to partake of food followed by vomiting, but any movement of the body induces painful retching and the patient experiences constant nausea, giddiness, and faintness. The abdomen is somewhat retracted, and pressure upon the epigastrium gives rise to pain.

As soon as the vomiting ceases and the patient is able once more to take nourishment by the mouth, he rapidly improves in health and soon regains the weight that he had lost. Between the attacks he usually presents a healthy appearance and declares that he is perfectly well. Careful examination, however, will show that the stomach contains a small quantity of acid secretion in the early morning, while after a test-meal the gastric contents are unduly liquid and possess an excess of hydrochloric acid: in other words, a mild form of chronic hypersecretion exists without noticeable symptoms.

The most interesting **sequela** of an attack of acute hypersecretion is the supervention of jaundice. When this occurs the gastric symptoms rarely persist for more than two or three days, and it is not until the vomiting has subsided

that the skin and conjunctivæ exhibit an icteric tinge. The urine is loaded with bile pigment, the stools are clay-coloured, and great apathy and depression are complained of. This condition may last for several days and is apt to recur after each subsequent attack of the gastric disorder. It appears to be due to the irritant effect of the hyperacid gastric contents upon the duodenal mucous membrane, which induces a mild attack of duodenitis with resultant obstruction of the bile duct. Frequent attacks of acute hypersecretion invariably give rise to dilatation of the stomach, with chronic inflammation of its mucous membrane, and in the great majority of the cases chronic hypersecretion eventually supervenes. The occasional occurrence of mild hæmatemesis from erosions of the gastric mucosa has already been mentioned.

Diagnosis.— The similarity that exists between the general symptoms of acute hypersecretion, acute gastritis, and migraine renders it impossible to diagnose the complaint merely from a patient's description of an attack. An examination of the vomit, on the other hand, always provides important results. Thus, if the ejecta are found to consist of gastric juice containing both free hydrochloric acid and pepsin, and if large quantities of this fluid are vomited from time to time without the introduction of any food into the stomach, the diagnosis of hypersecretion is at once established. Furthermore, if, after the subsidence of the acute symptoms, exploration of the stomach in the early morning proves the viscus to be empty, there can be little doubt that the continuous secretion of gastric juice was not chronic in character. An attack of acute gastritis is usually characterized by epigastric discomfort rather than pain, headache is absent or of a mild type, and the vomit consists of alkaline and bile-stained mucus.

In cases of migraine the vomiting, like that of hypersecretion, usually affords relief to the other symptoms; but

in this disorder severe headache is the predominant symptom, while the ejecta are small in quantity, alkaline in reaction, and consist entirely of mucus mixed with a variable amount of yellow bile. Epigastric pain is absent, the attacks occur at frequent intervals, but rarely last more than forty-eight hours, and a family predisposition to the complaint can usually be determined.

In those rare cases of locomotor ataxia in which hypersecretion occurs with the gastric crises, the sex and age of the patient combined with the physical signs of spinal lesion are sufficient to indicate the true nature of the malady.

Treatment.—(1) *During the Attack.*—In all cases the patient should be confined to bed as long as pain or vomiting persists. No food should be allowed by the mouth, but a little ice may be sucked if thirst is severe, or the patient may be encouraged to rinse out his mouth at intervals with hot water. If the vomiting persists for more than twenty-four hours, from 15 to 20 ozs. of warm peptonized milk should be slowly introduced into the rectum through a tube every six hours, and the bowel be washed out with a weak solution of common salt every morning. In this manner irritation of the stomach by the ingestion of food is avoided, and the duration of the attack is much curtailed. Some authorities prefer to administer food by the mouth during the whole period, and for this purpose recommend milk mixed with Vichy or lime water, white of egg, or hard-boiled eggs.

The quickest method of relieving the pain and sickness is to introduce a soft tube into the stomach, and after evacuating the organ of its acid contents, to wash it out thoroughly with a weak solution of bicarbonate of sodium (2 grains to the ounce). Some writers recommend a solution of nitrate of silver (1 in 1,000) with the view to controlling the secretion of gastric juice, but this treatment is rarely

of any value and is very apt to excite pain. When the retching and vomiting are extremely severe, it is a good plan to introduce through the tube a drachm of the carbonate of bismuth suspended in 6 ozs. of water at the completion of the lavage and to leave it in the stomach. As a rule, the lavage should be repeated every six hours, but it is seldom required more than four times during the attack. If the tube cannot be employed, excessive pain may be controlled by an hypodermic injection of morphine, while a mixture containing bicarbonate of sodium combined with carbonate of bismuth and calcined magnesia should be administered every two hours with the object of neutralizing the excessive acidity of the gastric contents. As soon as the vomiting has subsided iced whey or koumiss may be given in doses of one fluid ounce every thirty minutes, and subsequently raw eggs, egg and milk, milk and lime water, or meat juice may be allowed. Thereafter the dietary is rapidly enlarged until the patient is able to resume ordinary food.

(2) *Between the Attacks* an effort should be made to remove the cause of the complaint. With this object the contents of the stomach should be examined after a test-meal, when the existence of hyperchlorhydria can be determined. If it can be shown by the incidence of the attacks that mental or physical overstrain is an important factor in their causation the patient must be advised to limit his labours and to take regular exercise in the open air. Smoking is always harmful and should be prohibited. Alcohol, wines, beers, and cider are all liable to increase the gastric secretion and should be abandoned. In many instances an attack can directly be traced to indulgence in a small quantity of wine or spirits. As in cases of chronic hypersecretion, green vegetables, fruits, pickles, rhubarb, and coffee never agree, and all so-called " tonic " medicines must be avoided for a similar reason.

Chronic Hypersecretion

Etiology.— Various statements have been made concerning the frequency of chronic hypersecretion, some writers pronouncing it to be a common complaint, while others consider it a rare one. Among my five hundred cases of dyspepsia treated in hospital there were twenty-five examples of this disorder (5 per cent.), while among those examined in private practice the percentage frequency of the complaint was 32·4.

Since the war gastric hypersecretion has become much more prevalent, and among my last thousand cases of dyspepsia no fewer than 593 exhibited the symptoms and signs of this secretory disorder.

The general symptoms of hypersecretion appear to have been quite familiar to English physicians of the early part of last century, who were wont to ascribe them to an " acid " or " irritative " dyspepsia, but it was not until the publication of Reichmann's researches in 1882 that the association of certain clinical phenomena with a continuous secretion of gastric juice was recognized. According to this observer, chronic gastrosuccorrhœa is a secretory perversion of nervous origin, and as such it is still regarded by the great majority of physicians. On the other hand, Schreiber and those who follow him contend that the healthy stomach is never entirely empty, and that in the early morning a certain amount of gastric juice may always be withdrawn from the organ owing to the stimulating effect upon the secretory glands of the dust, saliva, and mucus which are swallowed unconsciously during the night. Moreover, it is believed by this school that a continuous gastric secretion depends upon dilatation of the stomach, and that stagnation of food which ensues from gastrectasis, by acting as a stimulant to the mucous membrane, excites persistent secretion.

It is obvious, therefore, that two preliminary questions require to be settled before the etiology of the complaint

can be discussed, namely, does a healthy stomach contain gastric juice in the fasting state? and can simple gastrectasis, or motor insufficiency, induce hypersecretion?

With regard to the first point, the methods employed in the earlier investigations are open to criticism. It was formerly the invariable custom to explore the stomach with a soft tube, and then by means of pressure applied over the region of the stomach, accompanied by voluntary efforts of straining on the part of the patient, to squeeze out any material that might be contained in the organ. That such a procedure is ever capable of completely emptying a large flaccid bag with a plicated inner lining must be open to doubt when it is remembered that even the most careful lavage fails to cleanse the stomach of minute particles of food, while irritation of the gastric mucosa induced by the tube must of necessity excite a certain amount of secretion. On the other hand, by the employment of Gentile's evacuator, the stomach may completely be emptied within thirty seconds, during which brief time the tube cannot excite the secretion of more than a few drops of gastric juice. Many experiments conducted in this manner have convinced me that when a healthy stomach is carefully washed out and emptied by aspiration in the evening, and no food or drink is taken in the interval, aspiration on the following morning never reveals more than 10 c.c. of an opalescent fluid which is devoid of free hydrochloric acid.

Since this conclusion is in accord with the statements of Riegel and other modern writers who have employed an aspirator instead of the usual method of siphonage, it may be accepted that the presence of more than 20 c.c. of gastric juice in the fasting stomach is of pathological import.

With regard to the second question, namely, the supposititious influence of gastrectasis on the causation of hypersecretion, I would adduce the following facts: Primary gastric myasthenia, or atony, is always accompanied by

food stagnation, and yet gastric juice in quantities exceeding 10 c.c. is never encountered in the early morning even after a full meal has been taken on the previous evening, while lavage and aspiration of the stomach at night are followed by the signs of an empty organ the next morning. Again, a mechanical obstruction to the exit of chyme into the duodenum, such as results from adhesion of the pylorus or first part of the duodenum to a hydatid or gumma of the liver is not attended by the signs of hypersecretion, indeed, subacidity is the rule in such cases ; while that severe form of motor insufficiency that ensues from carcinoma of the pylorus is accompanied by a diminished rather than by an excessive secretion of gastric juice. It must, therefore, be accepted that continuous secretion of gastric juice never ensues from simple motor insufficiency.

Although it is well known that hypersecretion commonly accompanies chronic ulcer of the stomach, it is still the custom to regard a continuous secretion of gastric juice as a disorder of nervous origin and to attribute it to the same conditions that are supposed to excite simple hyperchlorhydria. Thus among the supposititious causes of the disorder, much stress is usually laid upon over-indulgence in rich and highly spiced foods, the abuse of alcohol or tobacco, inefficient mastication and long-continued mental strain or excitement ; but since these several conditions are also held responsible for other forms of indigestion, while their mere existence does not explain why they should excite in one individual simple hyperchlorhydria, in another gastritis, and in a third hypersecretion, it seems advisable to investigate the various organs of the body as well as the habits of the patient in order to discover, if possible, some reason for such diverse consequences of the same cause. Until the year 1907 I had felt convinced from post-mortem evidence, as well as from the more limited results afforded by operations, that 88 per cent. of all cases of chronic

hypersecretion were accompanied by a demonstrable lesion of the digestive organs, while in the remaining 12 per cent. no disease which appeared to have any connexion with the stomach could constantly be demonstrated. I was, however, well acquainted with a peculiar type of hypersecretion in which death frequently resulted from acute appendicitis, and was in the habit of warning patients of their special liability to this disease ; but it was not until an opportunity occurred of discussing the subject with W. Mayo, of Rochester, that the cause of this appendicitis, and also an explanation of the 12 per cent. of cases hitherto unaccounted for, at once became apparent. That distinguished surgeon informed me that he had often discovered latent disease of the appendix in persons who seemed to require gastro-jejunostomy, and that the removal of the appendix was followed by the subsidence of the gastric symptoms, provided that the alimentary tract was otherwise healthy. Furthermore, that several of his earlier cases of gastro-jejunostomy which had not materially been benefited by the operation had subsequently been found to suffer from disease of the appendix, and that when this had been removed a cure had resulted.

With these facts in mind, the various surgeons who have operated for me on cases of hypersecretion during the last two years have examined the appendix as well as the other important abdominal viscera, and the results obtained in one hundred and twelve consecutive cases are as follows :

Chronic ulcer of the stomach existed alone in	13 cases
Chronic duodenal ulcer existed alone in	46 ,,
Gall-stones existed alone in	12 ,,
Diseases of the appendix existed alone in	22 ,,
Gastric and duodenal ulcers coexisted in	3 ,,
Duodenal ulcer and gall-stones coexisted in	3 ,,
Gastric ulcer and diseased appendix coexisted in	5 ,,
Duodenal ulcer and diseased appendix coexisted in	4 ,,
Cancer of the pylorus existed alone in	4 ,,
Total	112

Further experience has confirmed these general facts; but in my later cases the relative frequency of duodenal ulcer is much greater, while the habit of removing the appendix in every case of chronic hypersecretion has proved that ulceration of the mucosa, or other signs of disease of the organ, exists in nearly 80 per cent. of all cases.

Out of the thirteen examples of gastric ulcer, the disease occupied the cardiac portion of the viscus in four, the central zone in three, and the pyloric third in six; and it is interesting to observe that one of the most severe clinical examples of hypersecretion was associated with an ulcer close to the cardiac orifice. When gall-stones constituted the sole indication of disease, the calculus was often single and completely filled the gall-bladder, and in only one case was there a history of biliary colic. Hæmatemesis or melæna was noted in only three out of the forty-six examples of duodenal ulcer, notwithstanding that the average duration of the symptoms of hypersecretion prior to operation was nine years, while in several instances they had existed more than seventeen years. In only three out of the twenty-two examples of diseased appendix was there a history indicative of previous inflammation of the organ, although at operation it was found to be either extensively ulcerated, much thickened, dilated, or occupied by a calculus. Finally, it may be mentioned that in almost every instance the removal of the gall-stones or diseased appendix, or the performance of gastro-jejunostomy for ulcer, was followed by the subsidence, or at any rate by amelioration, of the former symptoms and by a corresponding diminution in the secretory activity of the stomach.

Although the number of cases is comparatively small, the results are sufficiently definite to permit of several conclusions being drawn from them.

In the first place, it is quite clear that *chronic hypersecretion is not a disease, but merely an expression of an organic*

lesion of some part of the digestive tract or of those organs that pour their secretions into it, and while most cases may be accounted for by the presence of gall-stones, gastric or duodenal ulcer, or a diseased appendix, I believe further experience will show that pancreatic calculus, cancer of the splenic flexure of the colon, and enlarged glands in the vicinity of the ileo-cæcal valve can also induce continuous gastric secretion in their early stages.

Secondly, whatever be the immediate cause of the hypersecretion, the continued existence of the latter not only excites inflammation of the stomach and duodenum, but also produces hæmorrhagic erosions, which occasionally increase in size and depth and finally acquire all the characteristic features of chronic ulcers. In this manner both gastric and duodenal ulcers are apt to ensue from hypersecretion due in the first instance to gall-stones or appendicitis, while the chronic colitis that develops in 80 per cent. of all cases of hypersecretion may eventually lead to inflammation of the appendix. Lastly, the existence of hypersecretion does not exclude the possibility of carcinoma ; on the contrary, the development of malignant disease in a chronic ulcer may excite for a time a continuous secretion of gastric juice. In such cases the neoplasm grows with extraordinary rapidity, is often accompanied by profuse hæmorrhages, and usually terminates fatally within seven months.

It is, of course, impossible to explain the exact connexion between these various lesions and a continuous secretion of gastric juice, but it is probable that a reflex irritation is chiefly responsible for it ; and in this connexion it is interesting to note that a temporary hyperchlorhydria can always be detected after the removal of an appendix, whether healthy or diseased. The most profuse secretion is usually associated with disease in the immediate vicinity of the pylorus, either on the gastric or duodenal side, and the highest degree of acidity is encountered in cases where,

owing either to cicatricial stenosis or to spasm, a chronic impediment exists to the exit of chyme from the stomach. On the other hand, central stenosis of the stomach (hour-glass) is very seldom accompanied by hypersecretion, and free hydrochloric acid is rarely found in this condition. Simple strictures of the jejunum and ileum resulting from the healing of tuberculous ulcers are usually associated with a diminution rather than an excess of gastric secretion, and the same may be said of both simple and malignant strictures of the large intestine, with the possible exception of cancer of the splenic flexure.

The sex and age of the patient vary according to the cause of the hypersecretion. In my cases, the female sufferers from gastric ulcer exceeded the male in the proportion of 3 to 1, while in duodenal ulcers the ratio of men to women was 2·5 to 1. The average age at the time of operation in both instances was about forty-one years. Hypersecretion due to gall-stones appears to be rather more frequent in women, while in that which ensues from appendicitis both sexes are equally affected.

Symptoms.—In the majority of cases the disorder commences in an insidious manner, with the symptoms of chronic hyperchlorhydria associated with recurrent attacks of acute hypersecretion, and it is only after the lapse of many months or even years that the phenomena characteristic of continuous secretion manifest themselves. In other instances the complaint commences abruptly when the patient is apparently in good health, and is attributed by him to exposure to cold, an indiscretion in diet, indulgence in iced water, beer, or stimulants, severe excitement, or to an attack of influenza or other febrile malady. In these latter cases the gastric symptoms either subside after a week or two, to recur again at short intervals, or they gradually assume a chronic form without exhibiting any decided intermission.

Pain in one form or another is invariably present and closely resembles that which ensues from simple hyperchlorhydria. Thus it usually commences by a sensation of fullness, uneasiness, or burning at the epigastrium one or two hours after each meal, and at the crisis of the attack may be so severe as to resemble biliary colic. This type presents three peculiar features which serve to distinguish it from the pain of other forms of dyspepsia. In the first place, it is particularly apt to develop *before a meal*, and if accompanied by a curious sense of emptiness and sinking at the pit of the stomach is sometimes referred to as " hunger pain." The long interval that elapses in such cases between the ingestion of food and the development of the pain usually indicates that the stomach is able to evacuate its contents into the intestine without trouble, but that the subsequent accumulation of a hyperacid gastric juice induces a painful spasm of the muscular coat of the viscus and of the pyloric sphincter. Some writers have tried to convince themselves that " hunger pain " is pathognomonic of duodenal ulcer, whereas, of course, *it is merely symptomatic of severe hypersecretion, of which ulcer of the duodenum is the most frequent, but by no means the sole, cause.* I have observed very well-marked instances of this form of pain in ulcer of the stomach near the cardiac orifice, in the centre of the viscus, and close to the pylorus, and also in gall-stones and ulceration of the appendix, and the only distinction I have been able to draw between them was that the symptom was most severe when an ulcer occupied the vicinity of the pylorus. The second important feature of the pain is the relief that is immediately afforded by the ingestion of proteid foods such as milk, albumin water, meat essence, biscuits, etc. This peculiarity is due to the strong chemical affinity that exists between albumin and hydrochloric acid in a free state, which results in the formation of a compound possessed of considerable stability and

yet devoid of the irritant properties of the free mineral acid.

Thirdly, nocturnal attacks of pain, while rarely met with in simple hyperchlorhydria or other varieties of dyspepsia, are almost invariable in hypersecretion, especially when it depends upon gastric or duodenal ulcer; and since they occur at a time when the stomach is partially devoid of food, they are usually experienced between 1 and 2 o'clock in the morning. The later the hour at which the last meal is taken the later will be the onset of the pain and, consequently, those individuals who habitually indulge in a supper near midnight often remain undisturbed until about 5 a.m. Conversely, a dinner at 6 p.m. may be followed by pain soon after the patient retires to bed.

It has already been observed that the pain varies considerably in degree in different cases and may be so violent as to resemble biliary colic. On the other hand, true pain may be entirely absent during the whole course of the complaint and gastric distention may be the chief symptom. This is particularly the case when the gastric disorder is due to disease of the appendix, and very many cases diagnosed as "flatulent dyspepsia," "nervous dyspepsia," or "amylaceous indigestion" are, in reality, examples of this nature. In such, weight, distention, or oppression at the chest is experienced from the time the patient gets up in the morning until he falls asleep at night, and is increased *immediately* after meals or even after raw milk. By means of a tube the stomach may be shown to contain a considerable amount of hyperacid gastric juice and gas at all times of the day, a fact which serves to explain not only the permanency of the discomfort, but also the inability to digest raw milk, which coagulates in large masses directly it is brought into contact with the gastric contents. As a rule, the true pain of hypersecretion is relieved not only by the ingestion of proteid food, but also by a dose of an alkaline

salt or a draught of cold water, the alkali acting by neutralization of the free acid and the water by mechanical dilution of the gastric juice. It is interesting to notice, however, that in certain cases of chronic hypersecretion due to old-standing disease of the appendix, the patient is unfavourably affected by alkalies and will often suffer great discomfort from a dose of bicarbonate of sodium. This symptom is due to secondary hyperæsthesia of the gastric mucous membrane and is so significant that I have often been able to diagnose the appendicular disease from its existence. With regard to the localization of the pain, its maximum intensity is usually referred to the centre of the epigastrium or to the region of the pylorus, whence it radiates over the upper half of the abdomen and front of the chest. When the sensation is referred to the right hypochondrium and back, gall-stones are sometimes, though by no means invariably, found to be the cause of the hypersecretion, while in not a few cases of latent disease of the appendix, pressure over McBurney's point produces pain in the epigastrium, or vice versa.

In certain cases of duodenal ulcer the pain is felt entirely in the left hypochondrium, and the same phenomenon is met with occasionally in gall-stones. I have never been able to determine at operation the cause of this peculiar location of the pain; but the fact remains that it does occur and is extremely apt to lead to an error of diagnosis.

Vomiting occurs in the majority of cases at some period of the disease, but varies considerably in different individuals and in different varieties of the complaint. Some persons vomit with the greatest difficulty and after suffering tortures of pain are obliged to induce emesis in an artificial manner in order to obtain relief, while others invariably vomit if affected only by a moderate degree of gastric discomfort. The personal factor must, therefore, always be taken into consideration when this symptom is under discussion.

Three varieties of vomiting are met with in chronic hypersecretion, the first of which occurs at the crisis of a painful attack and affords immediate relief; the second, which results from stenosis of the pylorus, appears late in the afternoon or on retiring to rest, and procures the expulsion of an immense quantity of acid fluid; while the third, which characterizes gastric intolerance, is incessant, is accompanied by much retching, and only results in the expulsion of a small amount of the acid mucoid fluid mixed, perhaps, with altered blood.

Emesis occurring at the crisis of an attack of pain is less frequent than is commonly supposed, and is often voluntarily induced. It is chiefly confined to cases where there is an open ulcer of the stomach or duodenum and is indistinguishable from the variety which usually accompanies that complaint. *Periodic vomiting* of large quantities of fluid always suggests gastrectasis due to stricture of the pylorus or first part of the duodenum, or prolonged spasm of the pyloric sphincter. That this latter condition may closely simulate an organic stricture is a common observation, and I have seen many cases of chronic hypersecretion in which prolonged food retention, marked gastrectasis, visible peristalsis of the stomach, and typical periodic vomiting have disappeared under daily lavage and a liquid diet, and have subsequently been proved by operation to be quite free from stricture or even kinking of the duodenum. According to my experience, vomiting is comparatively infrequent in hypersecretion due to appendicular disease, while in that which results from gall-stones it chiefly occurs at night. Nocturnal vomiting is extremely common in the hypersecretion that attends gastric and duodenal ulceration, and the mere existence of this symptom should at once excite a strong suspicion as to the nature of the complaint. In such cases, after retiring to rest the patient usually falls into a heavy sleep, which gradually becomes troubled by

a succession of short but terrifying dreams. Gradually he returns to consciousness between 1 and 2 o'clock with an impression of discomfort in the chest and abdomen or with a sense of suffocation. Abdominal distention, flatulence, and acid eructations are soon succeeded by nausea which finally culminates in violent vomiting, as the result of which a large quantity of a thin, acid, and often bile-stained fluid is ejected. The relief experienced by the emesis is usually so profound that the patient is able to sleep for the rest of the night, but in advanced cases his rest continues broken and unrefreshing until another attack of vomiting ensues about 5 a.m. Aching in the throat and lower jaw, headache, thirst, palpitation of the heart, profuse salivation, and shivering are often concomitant symptoms.

In exceptional instances diarrhœa replaces the emesis, and in such it is reasonable to infer that the spasmodic contraction of the pylorus becomes suddenly relaxed at the crisis of the attack and permits the contents of the stomach to pass into the intestines. Chronic diarrhœa ensues from secondary colitis.

The vomit varies considerably in amount in different cases, being especially abundant when hypersecretion is associated with organic stenosis of the pylorus and gastrectasis of a high degree. Under these circumstances a litre (35 ozs.) or more is often ejected on the first occasion, and half the quantity a few hours later, even when no food or drink has been taken in the interval. At an advanced stage of the disease, when the emesis recurs every few hours, more than four litres (5 to 7 pints) are sometimes vomited in twenty-four hours.

The vomit itself usually consists of an opalescent fluid, often stained yellow or green with bile, and possessing a sour taste and smell and an acid reaction. When ejected during the period of gastric digestion the material rapidly separates into two layers, the lower of which presents the

opaque appearance and dirty grey colour significant of undigested particles of food, while the upper one is comparatively clear, often coloured with bile, and covered by a thick layer of froth. The material is acid to litmus-paper and always contains free hydrochloric acid and the special gastric ferments. Its total acidity varies from 40 to 70. It is capable of digesting threads of fibrin when kept in a warm chamber, and of curdling milk after neutralization with bicarbonate of sodium. The sediment is found to consist of starch, vegetable fibre, shreds of meat, epithelial cells, and food débris.

In rare instances there is great intolerance of fat, and in such the vomit may be like liquid butter, or after standing present a soft crust of fat. In such cases chronic duodenitis with pancreatitis usually exists and is often of syphilitic origin.

From time to time attacks of *acute hypersecretion* are apt to supervene, as the result of which gastric intolerance becomes established, and the patient suffers from incessant retching and vomiting. In these circumstances only an ounce or two of a green mucoid fluid may be vomited on each occasion, and the proportion of free hydrochloric acid contained in it falls considerably below the former standard.

In debilitated subjects the exhaustion produced by constant vomiting and the inability to partake of nourishment often terminates fatally.

Flatulence is an invariable symptom and may ensue immediately after meals and persist all day or only occur at the height of gastric digestion and be relieved by a sudden expulsion of gas. It is chiefly due to fermentation of the carbohydrate constituents of the food which produces an excess of carbon dioxide, hydrogen, and small quantities of methane. A sense of extreme gastric distention is always experienced during the crisis of a painful seizure, and probably arises from violent contractions of the stomach accom-

panied by spasmodic closure of its orifices. Persistent and incurable flatulence is a common feature of a chronic mild hypersecretion that accompanies an indurated or atrophic appendix.

Acid eructations are met with in about 30 per cent. of all cases. As a rule the regurgitation of acid into the throat and mouth occurs at the end of gastric digestion and is particularly severe and distressing at night; but when the pyloric orifice is constricted or constantly contracted by spasm, acidity may ensue immediately after milk or other forms of food. In some instances the heartburn is replaced by a severe aching of the muscles of the throat or lower jaw. Chronic pharyngitis almost invariably ensues within a few months. Gall-stones are more often accompanied by acid regurgitations than other varieties of hypersecretion. When the fluid is collected and examined it is found to consist of gastric juice, which possesses a high degree of acidity without necessarily containing hydrochloric acid in a free state.

Unlike simple hyperchlorhydria, chronic hypersecretion is always accompanied by *loss of flesh*. At first there may be only a general flabbiness of the tissues with diminished elasticity of the skin; but subsequently the wasting affects all the subcutaneous fat of the body, so that the skin of the chest can be picked up in folds, the neck grows thin and cord-like, and the muscles of the trunk and extremities become so attenuated that the patient is no longer capable of undertaking his usual forms of exercise. Finally, when vomiting becomes a frequent symptom, the face grows haggard and cadaverous, the cheek-bones appear unduly prominent, and the expression indicates profound distress and melancholy. The rapidity with which the body loses weight varies in different cases, but it is always most rapid and pronounced in cases of cicatricial stenosis of the pylorus accompanied by frequent vomiting. Under these conditions

I have known a patient to lose 28 lb. within six weeks. The same rapidity of emaciation is observed during an intercurrent attack of acute supersecretion (gastric intolerance). The emaciated and exhausted appearance of a subject of hypersecretion, when associated with the symptoms and signs of pyloric obstruction, naturally suggests malignant disease, and unless every aspect of the case is taken into consideration, and the contents of the stomach be submitted to a chemical examination, even the most experienced clinicians may be guilty of an error of diagnosis. It is, therefore, important to note that however emaciated the patient may have become, he seldom displays that curious loss of physical and mental energy which characterizes carcinoma of the stomach almost from its inception, and weak though he may be he will often insist upon following his employment, or will continue to take an intelligent interest in it.

Anæmia is invariably present, and the complexion assumes a dirty, sallow hue ; but unless the disease is accompanied by hæmorrhage a cachexia like that met with in gastric cancer is rarely encountered. The total quantity of the blood becomes steadily reduced as the disease progresses, but its density does not diminish as it does in cases of carcinoma. As a rule there is an appreciable reduction of red corpuscles, but if vomiting is a frequent symptom, a relatively high count or even polycythæmia may exist. It is important to observe that, unlike carcinoma, the corpuscular richness of the blood in hypersecretion invariably increases with appropriate treatment in the absence of concealed hæmorrhage. A slight increase in the number of white corpuscles is present in most instances, and during the period of gastric digestion the so-called " digestion leucocytosis " may usually be observed. The hæmoglobin is always reduced in severe cases, and its percentage amount may fall as low as 50.

The *tongue* is usually moist, red, and clean. When, how-

ever, vomiting is excessive or the patient is confined to a milk diet, it is apt to become coated with a grey or white fur, and occasionally presents follicular ulcers along its margins or at its extremity.

The *appetite* varies at different stages of the complaint, but, as a rule, a marked desire for food is a notable feature of hypersecretion. At first, when the gastric juice contains an excess of hydrochloric acid, the patient usually partakes of food at short intervals, partly to counteract the sensation of sinking and faintness which he experiences so frequently, and partly because he knows that the ingestion of albuminous food will always relieve the pain. Occasionally an abnormal craving for nutriment termed " canine hunger " is observed, and large quantities of food will be devoured with avidity a short time after a full meal, and this may occur even after vomiting. Certain perversions of taste are often encountered, especially in cases of long duration, fats, oils, pickles, condiments, salt articles and starchy foods being usually regarded with the greatest repugnance, possibly on account of the increased pain which their ingestion entails. In rare instances a dislike to meat, similar to that met with in carcinoma of the fundus of the stomach, is observed. It must never be forgotten, however, that in hypersecretion, as in other painful diseases of the stomach, an apparent loss of appetite may really be due to the fear of provoking the distress which invariably follows indulgence in food. *Thirst* exists in every case, and is sometimes such a prominent symptom as to suggest, in combination with the increased appetite and loss of flesh, the possibility of diabetes. It is always most severe when the stomach is dilated and vomiting a frequent symptom. Unlike most varieties of thirst, it is increased rather than diminished by acid drinks, and is relieved by milk, alkaline beverages, and effervescent mineral waters.

The *bowels* are always confined, although attacks of

diarrhœa are apt to alternate with the periods of constipation. The stools are hard, dry, and knotty, and much irritation of the anus may be experienced after an evacuation. At an advanced stage of the complaint, when the patient is much exhausted by continual pain and vomiting, exposure to cold or the administration of a purgative will sometimes excite acute inflammation of the sigmoid flexure and rectum, attended by the frequent discharge of blood-stained mucus and much tenesmus and colic. An attack of this nature sometimes terminates fatally.

The *urine* in hypersecretion presents certain peculiarities. The quantity voided in the twenty-four hours is always diminished, and if vomiting is an urgent symptom the amount may not exceed 10 to 15 ozs. As a rule the fluid is cloudy when passed, and deposits a copious sediment of phosphates. Owing to its concentration and its relatively large proportion of soluble salts, the specific gravity usually exceeds the normal.

It is well known that an important relationship exists between the activity of the gastric secretion and the acidity of the urine, the greater the amount of hydrochloric acid secreted by the stomach during the process of digestion the less the total acidity of the urine which is voided during that period. It is, therefore, not surprising that in cases of hypersecretion the urine is frequently neutral or alkaline in reaction. The quantity of phosphates eliminated, expressed in terms of phosphoric acid, varies from 3·2 grm. (Lyon) to 5 grm. (Robin) per diem, but the average would appear to be about 2·7 grm. (Bouveret and Devic). The urea is invariably increased, and the patient eliminates considerably more of this salt than a healthy man of the same age who takes the same quantity of food. Thus, instead of the normal excretion of 30–40 grm. of urea per diem, the subjects of hypersecretion usually eliminate about 45 grm. in the twenty-four hours, while not infrequently

the total amount varies between 50 and 60 grm. This increase is probably due to the abnormal activity of proteid digestion which occurs as a result of the increased gastric secretion.

A diminution in the output of the *chlorides* is a remarkable feature of the complaint. Instead of the normal 12 grm. only 1 grm. or even less may be excreted per diem (Gluzinski, Sticker, Stroh). The greatest diminution occurs in cases where the patient is either unable to take nourishment, vomits frequently, or has his stomach constantly evacuated by a tube. According to Sticker and Stroh, the diminished elimination of chlorides is less dependent upon actual hypersecretion than on the stagnation of the food and vomiting that accompany it; but it would seem more probable that the excessive and prolonged manufacture of hydrochloric acid by the gastric glands causes a withdrawal from the blood of an abnormal amount of chloride of sodium, which subsequently becomes lost to the organism by vomiting. A marked diminution of the chlorides must be regarded as a bad omen, while an increased elimination of these salts usually predicates a betterment of the condition of the patient.

The secretion of *sweat* is usually deficient, and the skin is dry and harsh. In some instances patches of brown pigmentation make their appearance upon the forehead and malar bones and upon the anterior surface of the abdomen. As a rule the *pulse* is small and of low tension, and if vomiting is a frequent symptom the cardiac impulse is apt to become much enfeebled and the pulsations slow and irregular. Owing to the defective circulation, the hands and feet constantly feel cold and lifeless and are very prone to be affected by chilblains.

The Physiology of Digestion in Hypersecretion.—The presence of free hydrochloric acid in the empty stomach at once neutralizes the saliva introduced with the food and

puts a stop to the action of the ptyalin upon the starchy constituents of the meal. As a result of this inhibition, amylaceous substances tend to stagnate in the organ, and the gastric contents obtained after a test-meal fail to exhibit the usual reactions indicative of achroodextrin and maltose. The digestion of proteids, on the other hand, is much more rapid than usual, and an excess of peptone can always be detected in the material removed by a tube. It is possible, however, that the digestive power of the gastric juice in these cases is to some extent nullified by deficient absorption, since Brucke has shown that when gastrectasis exists the accumulation of peptone gradually inhibits the progress of proteid solution. It is probably owing to this cause that fragments of meat are so often found in the dilated viscus notwithstanding an abnormally active gastric juice. There is no reason to believe that a deficiency of the peptic ferment ever exists, for except in cases of atrophy of the stomach I have shown that a sufficiency of pepsin can always be extracted from the mucous membrane of the organ when treated with hydrochloric acid.

Abnormal fermentations invariably occur as the result of the retention of carbohydrates, and are especially active during the later stages of the secretory disorder when the stomach is dilated and the degree of acidity tends to diminish. In these circumstances the material extracted by the tube gives off numerous bubbles of gas if preserved for a short time in a warm atmosphere, which, on analysis, are found to consist of carbon dioxide, mixed with varying proportions of hydrogen and nitrogen, and occasionally with marsh gas. In rare instances the mixture is distinctly inflammable (Kuhn). Fats are melted in the stomach and occasionally undergo butyric fermentation.

Examination of the Stomach.—Inspection of the abdomen affords important indications of gastric dilatation and hypertrophy. Thus when the pylorus or duodenum is stenosed,

the organ may form a distinct prominence in the umbilical region, while the normal protuberance of the epigastrium is replaced by a transverse furrow. Palpation of the swelling, or friction of the skin over it, usually excites active contractions of its walls which appear as slow, rhythmical waves that pass across the dilated viscus from left to right.

By the employment of auscultatory percussion the outlines of the stomach may be accurately mapped out upon the skin of the abdomen and chest, or the dimensions of the viscus may be rendered visible by pumping air into it through a tube or by the administration of alternate draughts of tartaric acid and bicarbonate of sodium. Either of these methods or radiography will demonstrate that the stomach is usually dilated in cases of chronic hypersecretion, and has also undergone downward displacement as a result of its increased weight.

In order to determine the motor power of the organ, lavage should be performed in the early morning or nine hours after a test-dinner. The presence of undigested food in the stomach before breakfast, when no form of nourishment has been taken since the previous evening, demonstrates a considerable degree of motor insufficiency, and always suggests stenosis of the pylorus or duodenum. The same condition, however, may result from a spasmodic contraction of the pylorus without organic stricture, and I have often been astonished to find a perfectly patent pylorus at operation in cases where such food retention had been a marked feature of the case. On the other hand, daily lavage combined with a milk diet for a week will usually abolish the phenomenon of undigested food in the fasting stomach for some time, whereas in cases of organic stricture the retention recurs as soon as solid food is substituted for the milk.

The spasmodic form of retention is much more variable in its appearance and degree than the organic form, and

will often disappear and recur without obvious reason, so that one morning the organ will contain a portion of the supper taken on the previous night, while on the next the acid fluid withdrawn by the tube will be quite clear and devoid of sediment. Radiography after a bismuth meal will demonstrate both varieties, and may also show thickening of the pylorus or distortion of the duodenum.

Palpation reveals an increased sensibility of the entire epigastric region and occasionally the presence of certain localized tender areas in the median line above the umbilicus or just to the right of the navel. Hyperæsthesia of the skin is rarely encountered, and the special points of superficial tenderness which are believed by some neurologists to indicate disease of different regions of the stomach can rarely, if ever, be detected. Occasionally a tender tumour may be felt in the region of the pylorus when the first part of the duodenum or the orifice itself is the seat of chronic ulceration, but even in these cases the size and definition of the mass depend to a great extent on the coexistence of pylorospasm.

Exploration of the Stomach with a Tube.—In order to obtain full and reliable information concerning the secretory and motor powers of the stomach, it is advisable to explore the organ under three separate conditions. In the first instance, the tube is inserted in the early morning before any food has been taken ; in the second, the organ is carefully washed out overnight and again explored in the early morning before breakfast ; while in the third experiment, a test-breakfast is administered when the stomach is empty and the viscus evacuated at the expiration of one hour.

(1) The results of an exploration in the early morning vary according to the condition of the stomach. In all cases of chronic hypersecretion the tube will evacuate a considerable quantity of an opalescent green or yellow fluid, which affords the usual tests of an active gastric juice

with free hydrochloric acid, and leaves on the filter-paper a small quantity of undigested starch in a state of fine subdivision. When, however, the secretory disorder is associated with organic stenosis of the pylorus or duodenum, or with severe pylorospasm, the fluid will be found to be mixed with a certain amount of undigested food, while its total acidity varies from 40 to 75. This initial experiment serves not only to demonstrate the existence of a continuous secretion of gastric juice, but may also constitute an important test of the patency of the pylorus.

(2) Exploration of the stomach in the early morning after lavage on the previous night, no food or drink having been taken in the interval, is the great test for hypersecretion. A healthy stomach under these circumstances is either completely empty or at most contains a drachm or two of an alkaline or slightly acid fluid. In a case of hypersecretion, on the other hand, the tube will evacuate from 100–1000 c.c. of a turbid greenish or yellow liquid, which is capable of digesting albumin and gives the usual colour reactions of free hydrochloric acid. This fluid is the secretion of the stomach mixed with bile, which has been produced without the usual stimulus afforded by the presence of food, and is consequently diagnostic of hypersecretion.

The rapidity with which the empty stomach secretes may be demonstrated by aspirating the organ at intervals of an hour, when, although no food has been taken, from 50–150 c.c. of active gastric juice may be withdrawn on each occasion.

The constant appearance of bile in the stomach is probably due to the suction action of the stomach during its periods of peristaltic relaxation, the hypertrophied organ acting like the rubber ball of an evacuator.

(3) If retention of food has already been proved to exist, the stomach is thoroughly washed out overnight, no food

or drink being permitted subsequently, and a test-breakfast composed of 4 ozs. of white bread or toast with 10–14 fl. ozs. (300–400 c.c.) of weak tea is administered in the early morning. One hour afterward the organ is evacuated. Under normal circumstances only 150–200 c.c. can be withdrawn after the lapse of an hour, but in severe hypersecretion more fluid may be recovered than was taken with the meal. The particles of bread are swollen and gelatinous and the filtered fluid is usually free from bile. The total acidity, instead of being 50–60, may vary from 70 to 110, and the free hydrochloric acid amount to 0·04–0·1 per cent. In other words, hyperchlorhydria usually coexists with hypersecretion. It is only in advanced cases of the disease, when the patient is much debilitated and vomiting is a frequent symptom, that the acidity of the fluid becomes diminished and the mineral acid fails to appear in the free state.

Complications.—In addition to the chronic gastritis and dilatation of the stomach which are invariably discovered after death from hypersecretion, there are several phenomena which, owing to their frequent occurrence and clinical importance, must be regarded as genuine complications of the disease. Of these the most interesting are gastric intolerance, hæmorrhage, ulcer, tetany, cancer, diabetes, and colitis.

Gastric Intolerance (Acute Hypersecretion).—This term is applied to a clinical condition frequently observed during the later stages of chronic hypersecretion, which is characterized by such excessive vomiting that the patient is unable to retain any form of nourishment in the stomach and is soon reduced to a dangerous state of inanition. Several explanations have been offered of these interesting attacks, but there can be little doubt that they are really identical with the acute variety of the disease which has been described already under the term "Intermittent Hypersecretion."

The onset of the disorder is marked by a sensation of fullness and distention of the stomach, loss of appetite, and somnolence, followed in a few hours by excessive epigastric pain, flatulence, acid regurgitations, intense nausea, and giddiness. Vomiting soon supervenes, and several times an hour the patient will eject a few ounces of a pale green, acid fluid, containing mucus and epithelial débris, and giving the ordinary reactions of gastric juice. Not infrequently the vomit becomes stained with blood after a short time, or presents a coffee-ground appearance. Intense nausea may persist even in the intervals of vomiting, and is always excited when an attempt is made to sit up in bed or to partake of nourishment. The exhaustion induced by the continued retching and the inability to retain food soon produces a serious failure of nutrition ; the pulse becomes slow and feeble, the temperature of the body falls steadily to a point much below the normal, the mouth is dry, the lips and gums are covered by sordes, and delirium often supervenes. The urine is greatly diminished in quantity, and only a few ounces may be voided in the twenty-four hours ; while the loss of fluid entailed by the repeated emesis causes the tissues of the body to shrink and produces an extraordinarily rapid loss of weight. If appropriate treatment be adopted the vomiting gradually ceases, the evidences of distress subside, the pulse becomes stronger, and the secretion of urine is increased. Unfortunately, however, the nature of the malady is often misunderstood and the case is apt to be treated as one of simple inflammation of the stomach. Under these circumstances the general nutrition becomes so much impaired that the patient succumbs to failure of the heart, in spite, perhaps, of a belated attempt to combat the exhaustion by rectal feeding. A correct diagnosis is easily made if all the facts of the case are taken into consideration and the vomit be submitted to analysis, since the symptoms of chronic

hypersecretion are sufficiently characteristic to excite immediate suspicion as to their nature, while the constant presence of free hydrochloric acid in vomit unmixed with food is practically pathognomonic of the disease.

Hæmorrhage.—Bleeding from the stomach is met with in rather more than one-half of all cases of chronic hypersecretion. It is most frequently observed during attacks of gastric intolerance, when the ejecta are apt to be either stained with blood or to present the appearance of coffee-grounds. This form of hæmorrhage is due to oozing of blood from the general surface of the gastric mucous membrane, which, owing to the irritant action of the hyperacid secretion with which it is constantly bathed, is intensely congested and affected with numerous interstitial hæmorrhages and erosions. This form of hæmatemesis is never dangerous, and subsides as soon as the vomiting ceases; but it may have the effect of partially neutralizing the free acid of the secretion and thus obscuring the most characteristic phenomenon of hypersecretion. In some cases melæna accompanies or even replaces hæmatemesis.

Severe hæmorrhage only occurs when the stomach or duodenum is the seat of simple chronic ulcer. In this condition the bleeding is apt to recur at short intervals and often proves the immediate cause of death. Simple ulcer attacked by carcinoma in the presence of hypersecretion is often attended by violent hæmorrhage, the new growth being apparently digested by the hyperacid gastric juice.

Simple Ulcer.—Although it is universally admitted that chronic hypersecretion is a common sequela of gastric and duodenal ulcer, the fact that a continuous secretion of hyperacid gastric juice due to gall-stones or appendicular disease is capable of exciting similar ulceration is not usually recognized. It has already been noticed that hypersecretion is always accompanied by a severe form of gastritis and that during the acute phase of the disorder

the mucous membrane becomes deeply congested and profusely studded with punctiform hæmorrhages and hæmorrhagic erosions, the latter of which frequently ooze blood and thus give rise to hæmatemesis and melæna. These erosions, instead of healing, occasionally enlarge and coalesce with the ultimate production of superficial ulcers of considerable size, which, although easily seen as soon as the stomach has been opened, *cannot be detected on external examination of the organ.* In several cases of this kind I have known ulcers more than an inch in diameter and extending to the muscular coat not only escape detection by the surgeon, but remain unsuspected by the pathologist until the stomach had been opened. I have also observed more than one instance of repeated hæmatemesis or melæna in which the most careful examination of the stomach and duodenum at operation failed to detect any signs of ulcer, but where the removal of unsuspected gall-stones or a diseased appendix was followed by a complete cure not only of the hæmorrhage but also of the concomitant hypersecretion. It is certain, therefore, that just as small erosions have a natural tendency to heal, so the large superficial ulcers also undergo complete repair when their exciting cause, namely, gastric hypersecretion, is removed.

On the other hand, when healing fails to ensue owing to the excess of free hydrochloric acid the ulcer gradually deepens, its edges and base become thickened, and it finally presents the characteristic features of a chronic ulcer which permit its detection on examination of the external surface of the stomach. This conversion of an acute into the chronic form of gastric ulcer can often be observed in practice. Thus in a case of chronic duodenal ulcer attended by severe hypersecretion which came under my care, the patient was suddenly attacked by symptoms of acute gastric ulcer, and when he subsequently consented to operation the original trouble in the duodenum was found to be ac-

companied by two ulcers on the posterior wall of the stomach, which were obviously of recent origin. These considerations help to explain the facts that in about 7 per cent. of all cases a duodenal ulcer is accompanied by one or more ulcers in the stomach, the frequent association of duodenal ulcer and gall-stones, and the coexistence of ulcer with latent disease of the appendix. I have no hesitation in saying that many cases of hæmatemesis in which no ulcer can be demonstrated at operation, as well as those of hæmorrhagic erosion accompanied by vomiting of blood, for which various names have been invented of recent years, are dependent upon undiagnosed hypersecretion, of which gall-stones or disease of the appendix is the unsuspected cause.

Tetany.—Since Kussmaul in 1869 drew attention to the occasional occurrence of tetany in cases of dilatation of the stomach, the disorder has become recognized as an important complication of chronic hypersecretion. In the great majority of the recorded cases the gastrectasis was found to depend upon the existence of a chronic simple ulcer or its scar on the gastric side of the pylorus, but in some instances the ulcer was situated either in the duodenum (Bamberger, Renvers, Dujardin-Beaumetz) or involved both the stomach and the first portion of the bowel (Loeb, Müller, Neumann, Thiroloix). Cancerous infiltration of a simple ulcer has been observed three times (Bouveret and Devic, Riegel, Richartz). In rare instances tetany ensues from other causes of gastric dilatation than ulcer. Thus in one of Müller's cases an hour-glass deformity of the stomach was accompanied by twisting of the duodenum; Blazicek has related one in which the pressure of an enlarged gall-bladder had given rise to obstruction of the first part of the duodenum; while in a case of my own, published by Young, a chronic ulcer of the lesser curvature had produced twisting and obstruction of the second part of the

duodenum. Even compression of the first part of the intestine by a cyst of the pancreas has proved fatal by tetany (Berlizheimer).

A careful analysis of the symptoms presented by the various cases appears to indicate that a tonic contraction of the muscles of the extremities is not the only feature of the nervous complaint, but that general convulsions of an epileptic or tetanic nature are also apt to supervene. The nervous phenomena may therefore be divided into three classes :

(1) A form of tonic contraction of the muscles of the extremities closely allied in its general features to true tetany.

(2) An intermittent form of spasm attacking the muscles of the trunk, especially those of the jaw, neck, back, and respiratory system.

(3) General convulsions of short duration, attended sometimes by loss of consciousness, and resembling ordinary epileptic fits.

The two latter varieties never occur alone, but are always associated with the first mentioned, which must therefore be regarded as the fundamental type of the disease.

(1) *Tonic spasm* of the muscles of the extremities was the initial symptom in every case that has been recorded. It usually develops quite suddenly after a severe attack of vomiting or diarrhœa, but it is sometimes preceded by a sense of numbness, tingling, or stiffness of the hands and feet. In typical cases the elbows and wrists are semiflexed and the forearms strongly pronated ; the fingers are drawn together and firmly bent over the thumbs, while the palms are hollowed by the approximation of the thenar and hypothenar eminences. In the lower limbs the toes are bent downward and adducted ; the soles of the feet are hollowed, and the heels are drawn up by the contraction of the muscles of the calves. Considerable pain is experienced during

the continuance of the spasm, and in many instances the affected parts appear blue and are perceptibly cold to the touch. The condition of the superficial reflexes is variable, but the deep reflexes are much exaggerated, and the muscles react more readily than usual to the interrupted current. Sometimes an attack can be induced by percussing or stroking the skin of the epigastrium (Müller, Gerhardt), by the administration of an enema, by the passage of a stomach-tube (Collier, Fenwick), or by compressing the main artery of a limb.

The other phenomena associated with this condition are neither uniform nor of great importance. The pupils are often contracted during an attack, but they still react both to light and accommodation. Severe headache is a frequent cause of complaint, and occasionally profuse perspirations are observed. Retention of urine occurs in the majority of the cases, and when the fluid is withdrawn by catheter it may be found to contain albumin. Sugar and acetone are occasionally detected in it (Fenwick, Biscaldi). Cutaneous sensibility rarely undergoes any noticeable alteration, but in a few instances transient hyperæsthesia or anæsthesia has been observed. The pulse is full and regular, the breathing quick and shallow, and the face and extremities usually show signs of cyanosis. The temperature of the body is depressed at first, but in fatal cases it often rises and may reach 109° F. before death (Collier). The intellect usually remains unaffected. In almost every case the first attack is followed within a short time by several others, but occasionally the second seizure is separated from the first by an interval of several months. In only one instance has death taken place in the first attack (Fenwick). The actual duration of the spasm is also liable to considerable variation, lasting in some instances from five minutes to six hours while in others it remains persistent for three or four days.

Nearly 50 per cent. of the cases in which tonic spasm was the only symptom terminated fatally, death being usually ushered in by delirium, a quick pulse, and a rapid rise of temperature, followed by coma with dilated pupils. In some instances the patient retained consciousness until the last, and succumbed to gradual respiratory and cardiac failure.

(2) In nearly one-half of the cases the condition of simple tetany was complicated by *convulsive seizures* which affected the muscles of the neck, jaw, back, and face. These attacks were intermittent in character and lasted from a few minutes to half an hour, disappearing as suddenly as they came on, and leaving the muscles in a state of semi-rigidity. During their continuance the patient was unable to open the mouth or to swallow, and in several cases opisthotonos was a marked symptom. This form of convulsion must therefore be regarded as a species of tetanus, and, like the surgical variety of that disease, its appearance is always a sign of the deadliest import, for in every instance where it has occurred death ensued from failure of the respiration.

(3) In about 12 per cent. of the entire number, the initial tetany is said to have been followed by convulsions which were indistinguishable from those of ordinary epilepsy. The fits were repeated in rapid succession, and a fatal termination was recorded in two-thirds of the cases.

According to Gumprecht, nearly three-quarters of the cases of tetany occur between the months of January and March, and there can be no doubt that the disorder is exceptionally rife during the cold months of the year. The greater liability of men to the complaint obviously depends upon the greater frequency of chronic ulceration of the pylorus and duodenum in the male sex.

The theory which enjoys the widest acceptance at the present time attributes the nervous symptoms to the absorption of some organic poison, produced in the dilated stomach by bacterial action (autointoxication). According

to Bouveret and Devic, the connecting link between the two affections is to be found in the excessive and continuous secretion of gastric juice. These observers were able to separate from the gastric contents of one of their cases a substance that was soluble in alcohol, and which gave rise to convulsions when injected into animals. Fleiner is also stated to have obtained somewhat similar results. On the other hand, Jaksch and Berlizheimer, Müller, and Blazicek all failed to obtain a specific poison from the cases under their care, while Gumprecht's elaborate investigations were also negative in their results. The last writer also points out that whenever an organic poison is absorbed from the gastrointestinal tract a certain proportion must be eliminated by the kidneys, and he was able to demonstrate in one case that the renal secretion possessed an abnormally high urotoxic coefficient, which, however, continued both during the attacks and in the intervals. Ewald and Jacobson extracted a body allied to ptomaine from the urine in one case.

With regard to the possible influence of hyperchlorhydria it may be noticed that an excess of the acid was absent in the case recorded by Blazicek, and that tetany has been observed in pyloric obstruction due to cancer and external pressure, conditions which are not usually accompanied by excessive acidity of the gastric juice. It is therefore probable that the nervous symptoms are due to auto-intoxication from a dilated stomach, the development of which is favoured by hyperchloracidity of the gastric contents.

Carcinoma.—A simple chronic ulcer is always liable to become the seat of a cancerous growth, and under these circumstances the hypersecretion which accompanied the initial disease may continue for some time after the development of the neoplasm. Very rarely is hypersecretion followed by carcinoma without an intermediary ulcer. Of

this interesting condition, however, I have met with four examples, all of which occurred in men of middle age. In each instance the pylorus was affected by a columnar-cell growth which gave rise to stenosis of the orifice. The disease progressed with extraordinary rapidity, and the average duration of life was less than nine months. A tumour was present in three cases, and formed a sausage-shaped mass extending from the pylorus along the lesser curvature. No secondary growths occurred in the liver or peritoneum, but the perigastric and retroperitoneal lymphatic glands were found to be much enlarged at the autopsy. The most interesting feature of these cases was the occurrence of repeated hæmorrhages, due apparently to destruction of the soft cancerous tissue by the hyperacid gastric secretion and the erosion of blood-vessels of considerable size situated in the deeper portions of the tumour. In two instances death ensued as a result of excessive loss of blood, while in another fatal asthenia ensued from an attack of gastric intolerance.

Chronic ulcer of the duodenum is always liable to set up chronic pancreatitis, and consequently *diabetes* is an occasional complication of hypersecretion. The urine should, therefore, be examined for sugar at regular intervals.

Inflammation of the colon complicates about 80 per cent. of the cases of hypersecretion owing to irritation of the intestine by its abnormally acid contents. In this condition the first motion of the day is apt to be followed by several evacuations of stringy or jelly-like mucus; griping pains are experienced in the region of the sigmoid flexure in the early morning, and much complaint is made of uneasy sensations in the umbilical region, nausea, giddiness, distention, and borborygmi. Concretions or inflammation of the appendix frequently ensue and the colitis doesnot necessarily improve after successful gastro-jejunostomy. *Pharyngitis* as well as postnasal and laryngeal catarrh almost invariably

accompany the gastric disorder and are never cured as long as the stomach continues to secrete an excess of acid. Many professional singers and public speakers have been obliged to abandon their profession on account of these troublesome complications of hypersecretion.

Urticaria occurs in about 12 per cent. of all cases of chronic hypersecretion. As a rule, it develops at intervals and after lasting for a few weeks disappears for several months; but occasionally it remains persistent and constitutes an extremely troublesome complication of the gastric disorder. In the diffuse form, the greater part of the trunk and extremities presents the characteristic papules and wheals, which develop during the evening or at night; but in one peculiar and rare variety of the complaint the eruption follows the distribution of certain nerves and is often limited to the shoulders, the external parts of the thighs or to the skin supplied by the lower intercostals. This latter variety also exhibits a tendency to *alternate* with rather than to accompany the gastric disorder, and is consequently most conspicuous when the nocturnal pain remains in abeyance; while during an acute exacerbation of the dyspeptic phenomena the urticaria either disappears or is negligible in degree. Both varieties are increased by indulgence in chocolates and sugar, raw fruits, coffee and ices, and are often improved by exercises that induce sweating and by warm baths at night. A peculiar pruritus which sometimes accompanies chronic appendicitis is described in the chapter which deals with Displacements of the Stomach.

Course and Termination.—Chronic hypersecretion is a disorder of long duration and may persist more than twenty years. The most protracted cases are those which ensue from appendicitis in early life or where the gall-bladder is occupied by a single calculus. An ulcer situated on the posterior and outer wall of the first or second part of the

duodenum is comparatively seldom accompanied by hæmorrhage or perforation, and I have known several instances of this kind in which the disease had persisted for eighteen years or longer before it was diagnosed and an operation undertaken for its cure. As a rule, however, the excessive pain, vomiting, and emaciation that ensue from an ulcer either demand operation or terminate fatally within fifteen years. Regarded strictly from a clinical point of view, the various cases may be arranged in three classes according to the severity of their symptoms and their probable causation :

(1) In the first or mildest type the disorder usually displays an intermittent character for several years, the attacks themselves being attributed by the patient either to a chill, mental worry, or to some indiscretion in diet. When the complaint assumes a chronic form, persistent flatulence, abdominal distention, gaseous eructations, want of appetite, giddiness, constipation, and a sense of general malaise or " biliousness " constitute its principal symptoms. Vomiting and acidity rarely exist, but the patient remains thin, anæmic, and nervous, is easily exhausted and suffers greatly from mental depression. The stomach is slightly dilated and dislocated downwards, but presents neither tumour, local tenderness, nor visible peristalsis. A tube passed in the early morning sometimes shows the organ to be empty, while at others several ounces of active gastric juice or thick mucus can be withdrawn, and after a test-breakfast the total acidity of the filtrate exceeds the normal, and free hydrochloric acid is usually present in slight excess. It is important to notice, however, that in many long-standing cases and especially in those of appendicular origin *the hyperacidity is replaced by subacidity*, and when seen for the first time this may prove puzzling to those who base their diagnosis entirely upon a chemical investigation of the digestive processes, especially if they forget that an

atrophic gastritis is apt to follow hypersecretion. The history and general condition of the patient, however, are usually so characteristic that the existence of subacidity ought to confirm rather than invalidate a diagnosis of chronic hypersecretion.

Cases of this description, which endure a miserable existence, are almost invariably diagnosed as " nervous dyspepsia " or " gastroptosis " by the medical profession and regarded as hypochondriacs by their acquaintances. No form of medical treatment does any permanent good, and even alkalies give rise to pain or discomfort. After many years they are usually attacked by acute suppurative appendicitis which often terminates fatally. At the operation adhesions or other signs of former appendicular disease are discovered.

(2) In the second type the ordinary symptoms of hypersecretion are present, and a certain amount of pain with flatulence and acidity are experienced one or two hours after meals. Vomiting occurs occasionally and the nights are disturbed by indigestion. The disorder varies in severity from time to time, but gradually becomes more troublesome and more refractory to treatment.

Food-retention is frequently found on evacuation of the stomach in the early morning, but may be kept in check for some time by systematic lavage. When the stomach has been washed out overnight and no food taken in the interval several ounces of green, acid fluid may be withdrawn the next morning, and a test-breakfast shows a considerable excess of fluid and the presence of free hydrochloric acid. Cases of this description may be due to gall-stones, chronic appendicitis, or duodenal ulcer, and even when the last-named is absent at first, it is apt to develop during the course of time. The disease may last for many years, and if not subjected to operation, usually terminates by general asthesia, gastric intolerance, or by some other complication.

(3) The third and most serious variety is undoubtedly that which depends upon an ulcer near the pylorus, either gastric or duodenal. Pain is always a noticeable feature and is accompanied by typical symptoms of hypersecretion. The stomach gradually dilates and when full of food or acid may present well-marked peristaltic movements. Vomiting and pain ensue almost every night between 1 and 2 a.m., emaciation makes steady progress, and intercurrent attacks of gastric intolerance are usually accompanied by slight hæmatemesis. Retention of food is an invariable phenomenon and if the pylorus is stenosed does not disappear after systematic lavage. It is in this condition that the various complications, both immediate and remote, are usually observed, and unless the case is subjected to operation death invariably results.

Diagnosis.—Chronic hypersecretion is a complaint that is easy to recognize if attention is bestowed upon certain characteristic symptoms and physical signs of which the following are the most important: (1) After many remissions the dyspepsia has become permanent and defies the usual methods of treatment. (2) Pain or discomfort ensues regularly two to three hours after a meal or at other times when the stomach is almost devoid of food. (3) Vomiting often occurs at the crisis of an attack of pain and is especially frequent between 1 and 2 a.m., when the ejecta consist of a greenish, acid fluid that contains free hydrochloric acid. (4) The appetite is usually increased and severe thirst may be experienced after vomiting. (5) The urine is scanty, cloudy, contains an excess of phosphates, and is deficient in chlorides. (6) The patient steadily loses flesh and strength and may exhibit marked cachexia. (7) The stomach is dilated and signs of pyloric stenosis or pylorospasm are present. (8) Exploration with a tube in the early morning after lavage has been performed on the previous night, shows the stomach to contain from 6 to 20 fl. ozs. of an opales-

cent, greenish or yellow acid liquid which exhibits the usual characters of active gastric juice.

In the absence of a methodical examination of the gastric contents hypersecretion may present certain difficulties of diagnosis and may be mistaken for other complaints that are accompanied by severe gastric symptoms. Of these the most important are hyperchlorhydria, carcinoma, simple chronic gastritis, biliary colic, and diabetes.

The differential diagnosis of hyperchlorhydria has already been discussed. In this complaint pain ensues much sooner after food, is immediately relieved by an alkaline draught or a light meal, and subsides spontaneously after the eructation of gas or an action of the bowels. Vomiting never occurs, sleep remains undisturbed, emaciation and cachexia are absent and rapid improvement ensues when an appropriate treatment is adopted. On examination, the stomach is found to be empty in the early morning, while after a test-breakfast only a slight excess of hydrochloric acid can be detected.

There are many points of similarity between chronic hypersecretion and *gastric cancer*. In both diseases pain and sickness occur after food; emaciation, debility, and cachexia are often present; and there are signs of gastrectasis, accompanied, perhaps, by a tumour of the pylorus. On the other hand, careful investigation will always prove that the similarity of the two complaints is more apparent than real, while the results of a gastric analysis are absolutely different in the two cases. Cancer of the stomach is a much more rapid and debilitating disease than hypersecretion and its duration rarely exceeds eighteen months. From the outset the malignant complaint is accompanied by a sense of exhaustion and mental apathy that is wanting in the secretory disorder, and the loss of appetite or loathing of animal food affords a marked contrast to the extreme hunger that so often attends hypersecretion. In cancer,

pain may be absent, but when it exists it is constant rather than intermittent, ensues soon after meals, and is increased but never relieved by food. Hæmatemesis may occur at intervals, is usually of the coffee-ground variety, and is accompanied by a cachexia that does not improve under treatment. Emaciation is rapid and progressive, œdema of the ankles and thrombosis of veins are apt to develop and there is a degree of mental depression and hopelessness that is never met with in the functional disorder. A tumour connected with the pylorus may occur in both, but whereas in cancer it presents a nodular surface, a rapid growth, and is very tender on pressure, the inflammatory mass often varies in size and definition from time to time according to the degree of pyloric spasm, is quite smooth, and never grows rapidly. The coexistence of enlargement of the liver, nodules in the skin of the abdomen, or fluid in the peritoneal or pleural cavities all bespeak the probability of a malignant growth. But the most important factor in the diagnosis is the state of the gastric secretion. In cancer of the stomach the vomit is largely mixed with mucus and contains no free hydrochloric acid, while the material obtained after a test-breakfast presents little signs of digestion, and the filtrate is found to possess an abnormally low acidity with an absence of the free mineral acid. Lactic acid is often present. In the early morning, after lavage on the previous night, only a little opalescent fluid devoid of free hydrochloric acid can be withdrawn by the tube. Radiography shows dilatation of the organ and occasionally an infiltration of the stomach which cannot be detected by palpation. When a simple ulcer has become the seat of a cancerous growth the antecedent hypersecretion sometimes persists for a few months.

Simple chronic gastritis does not present the two symptoms that are characteristic of hypersecretion, namely, the painful crises and the vomiting of large quantities of acid gastric

juice. On the other hand, the subjects of this complaint suffer from distention and flatulence within one hour after each meal, and when they vomit the ejecta consists of undigested food mixed with much mucus but deficient in hydrochloric acid. Appendicular hypersecretion with subacidity may be indistinguishable from simple chronic gastritis.

Biliary colic and *enterospasm* may be mistaken for hypersecretion if attention is concentrated upon the abdominal pain; but the general history of the case combined with an examination of the abdomen will soon clear up any difficulty of diagnosis.

Hypersecretion has more than once been mistaken for *diabetes* owing to the coexistence of emaciation, thirst, and hunger. In ordinary diabetes, however, pain during digestion and vomiting are never encountered, while the special indications of the secretory disorder are absent; but it must be remembered that chronic pancreatitis sometimes complicates duodenal ulcer and in this manner glycosuria may be associated with hypersecretion.

Treatment.—Every case of chronic hypersecretion requires to be treated upon its own merits, special attention being paid to the type of disease, the degree of gastrectasis, and the presence of complications.

General.—There is no remedy so efficient in relieving the attacks of pain and sickness as methodical lavage of the stomach, while in those numerous examples of the complaint where the perversion of secretion is associated with stenosis of the pylorus the performance of lavage is essential to the maintenance of nutrition. In every case, therefore, where vomiting occurs at night or food is found in the viscus in the early morning, the stomach should be washed out at least once a day. The time at which the operation should be performed must be determined by the peculiar requirements of each case. Thus when sleep is disturbed by indi-

gestion or vomiting, lavage is most conveniently undertaken before the patient retires to rest, but in those cases where much muscular insufficiency exists it is advisable to wash out the organ before breakfast. As a rule, warm water containing about one grain of bicarbonate of sodium to the ounce is the most suitable fluid for the purpose, but some writers recommend boric acid (10 in 1,000) or other antiseptics for this purpose. Reichmann claims that irrigation of the stomach with a weak solution of nitrate of silver (1 in 1,000) has a direct inhibitive influence upon the secretion, but this method has not been attended by much success at the hands of other observers, and not infrequently gives rise to severe pain. It is a convenient practice to administer a dose of Carlsbad or other salts through the tube at the conclusion of the morning lavage.

In all cases the enlarged and dislocated stomach should be supported by means of a firm abdominal belt, which the patient can readjust night and morning. When duodenal ulcer or gall-stones is the cause of the gastric disorder, a few weeks' treatment at Carlsbad or Marienbad affords considerable relief, but if the stomach is much dilated mineral waters in large quantities should be avoided. Massage should never be recommended owing to the frequent association of hypersecretion with an open ulcer or a diseased appendix, while rubbing of the stomach in no way affects the excessive secretion. Electricity is also useless.

Diet.—The principal indication in the arrangement of a dietary is to avoid those articles of food that stimulate the gastric secretion and at the same time are not digested in the stomach. This class includes all amylaceous substances that have not been previously digested, sugar, excess of fats, and green vegetables. Few subjects of hypersecretion, whether the stomach be dilated or not, are able to take bread and starches without experiencing a considerable access of discomfort. On the other hand, experience teaches

that the total exclusion of starch from the dietary usually increases the tendency to loss of flesh and favours constipation, so that it is necessary to devise some method by which a moderate amount of carbo-hydrates may be given each day. The fact that the constant presence of gastric juice in the stomach at once inhibits ptyalin digestion and favours the fermentation of sugar, suggests that the organ should be emptied of its acid contents before starch is given, and that a suitable quantity of diastase should be added to the meal to aid the conversion of at least a proportion of the amylacea into sugar before the accumulation of hydrochloric acid puts a stop to the process. With these objects in view it is customary to wash out the stomach with a weak alkaline solution each morning, and immediately afterward to give a meal consisting of oatmeal, a cereal soup, bread and milk, milk pudding, or some special form of starchy food that has already been partially digested. Occasionally a solution of dextrose may be given with advantage, or a full dose of extract of malt or takadiastase may be administered at the end of the meal. Bread almost invariably increases the pain and flatulence and should therefore be omitted in favour of thin toast, rusks, starch-free biscuits, Brusson-Jeune rolls, or the Energen preparations.

Green vegetables never agree, but well-cooked asparagus, cauliflower, seakale, or even stewed celery may be allowed in moderation. All varieties of fruit give rise to increased pain and acidity, more especially the stone varieties and strawberries. Apples, baked or stewed, without sugar, and oranges are the least harmful.

The patient should be encouraged to take a moderate amount of butter and cream with his meals, but excess must be avoided as in many cases they produce a form of fat-vomiting. Few subjects of hypersecretion are able to take alcohol without discomfort and very often an attack of

gastric intolerance can be traced to indulgence in even a small quantity of wine or spirits. Tea always disagrees and in many instances coffee must also be prohibited, but cocoa made from the nibs or husks and diluted with milk, or the plasmon and peptonized cocoas can usually be taken with advantage. At other meals one of the natural alkaline waters, milk and soda-water, whey, or orange-juice and water are the best drinks. Milk is invaluable in all cases since it rapidly fixes free hydrochloric acid and is a comparatively slight stimulant to secretion. When raw milk gives rise to immediate discomfort it is certain that the stomach contains a large amount of stagnant acid, and lavage may have to be performed for several days before milk can be tolerated. In most cases, however, the patient derives the greatest comfort from a milk diet, and is able to take from 6 to 10 ozs., either raw or mixed with lime-water, every two hours. If milk disagrees, fresh whey should be given or Horlick's malted milk may be tried; while sometimes the dried milks, like Glaxo, answer very well. Of recent years sour milk prepared in the manner recommended by Metchnikoff is regarded by many as the true panacea for all dyspepsias, but, according to my experience, it never agrees when the gastric juice contains an excess of free acid and is consequently unsuitable in hypersecretion. On the other hand, I have seen a few cases of long-continued "appendicular" hypersecretion where the stomach produced a subacid secretion in which the sour milk gave great relief.

Unless the gastric disorder depends upon an ulcer of the stomach, animal food may usually be allowed, especially if it be finely minced and carefully masticated. Mutton, lamb, veal, ham, cold bacon, poultry, fresh game, sweetbreads, tripe, calf's head and feet, or sheep's brains should be lightly cooked and taken at the midday meal, while at other times fish, meat essences, clear soups, jellies, custards,

junket, and eggs may be allowed. If a craving for food develops soon after a meal it can usually be allayed by a little egg and milk or biscuits.

Medicinal.—Drugs are administered with the objects of allaying pain and vomiting, relieving constipation, and restricting the secretion of gastric juice.

Pain usually demands the exhibition of an alkali with the view of neutralizing the excessive acidity. For this purpose full doses of bicarbonate of sodium, solution of potash, carbonate or peroxide of magnesia, powered chalk, hydroxide of alumina, or of ammonio-magnesium phosphate are usually given two hours after each meal and repeated if necessary. When much dilatation of the stomach exists the solution of potash or salts of magnesia are to be preferred to the alkaline bicarbonates. Personally, I have a very high opinion of carbonate of bismuth not only as an antacid but also as a gastric sedative, and invariably combine 15 grains with a similar amount of bicarbonate of sodium and a teaspoonful of glycerin. If flatulence is a troublesome symptom, the addition of 10 drops of the glycerin of carbolic acid is of considerable use. Sedatives are indicated whenever pain is severe, in which case 10 to 15 minims of the solution of morphine may be added to the alkaline medicine. Belladonna is occasionally of service, but it is apt to produce dryness of the mouth and thirst. A saline administered in hot water before breakfast is the best remedy for the constipation, as it not only induces a free action of the bowels, but also sweeps into the intestine the gastric juice which has collected during the night and thus performs a kind of internal lavage. In most instances a mixture of the dried sulphate and phosphate of sodium is the best saline for the purpose, but the artificial Carlsbad salts, the carbonate and sulphate of magnesia, Rochelle salt, or the tartrate of potassium may all be employed with good results. The natural aperient waters are not nearly so

efficacious. In very chronic cases an occasional dose of calomel at night improves the appetite and removes the feelings of biliousness. Hypersecretion dependent upon latent disease of the appendix, if it has existed for many years, is apt to be accompanied by a diminution of hydrochloric acid in the gastric juice. In these cases the constant feeling of distension and flatulence may often rapidly be relieved by the administration of twelve to fifteen minims of dilute hydrochloric acid combined with a drachm of glycerin and three minims of tincture of capsicum after meals. This treatment, owing to its tendency to excite mild gastritis, should be omitted every fortnight for a week. The employment of opium, belladonna, atropine, and nitrate of silver with the view of directly controlling the excessive secretion of the stomach is never attended by permanent benefit. The so-called "tonics" never agree, and the disorder may be kept up indefinitely by the inclusion of nux vomica in a prescription.

Treatment of Complications.—(1) *Gastric intolerance* requires to be carefully treated, since it is very apt to give rise to fatal inanition. No food should be given by the mouth, but small pieces of ice may be sucked from time to time and the buccal cavity washed out at intervals with warm water. The patient must be confined to bed as long as the vomiting continues, and the temperature of the body should be maintained by adequate clothing and the use of hot-water bottles. The nutrition must be sustained entirely by enemata of peptonized milk. It was formerly the custom to limit the size of each enema to 2 fl. ozs., and to give an injection every two hours, but the constant discomfort and the very limited amount of nourishment that is absorbed render this method quite unsuitable. At the present time the use of peptonized milk injections in doses of 12 to 20 ozs. every six hours has quite revolutionized rectal feeding, since it is found that not only can the nutrition

be maintained almost indefinitely by this procedure, but the patient will cease to suffer from hunger and may actually increase in weight. The apparatus required consists of a soft-rubber catheter, about 3 feet of rubber tubing, and either a glass reservoir capable of holding a pint of fluid or a Thermos flask used in the inverted position, or a simple funnel. The patient reclines upon his left side with the buttocks elevated on a pillow; the catheter, previously warmed and oiled, is inserted into the rectum for about 6 inches, and the warm peptonized milk is allowed to run *slowly* through the tubing into the bowel from the reservoir which is placed about 1 foot above the level of the patient's body. The main object to be kept in view is to ensure that the milk flows so slowly into the intestine that it does not excite peristalsis, and consequently at least one hour should be occupied in the administration of 15 ozs. of milk, and no attempt must be made to hurry the operation. If these precautions are taken and the rectum be washed out with normal salt solution night and morning, the method may be continued until the vomiting has entirely ceased. Subsequently, small quantities of iced whey are allowed by the mouth, and the diet is gradually increased until the patient is able to resume his former mode of life. Rectal feeding is apt to be followed by parotitis unless the secretion of saliva is maintained. For this purpose the patient should be encouraged to suck an india-rubber teat at frequent intervals and to chew a little horseradish occasionally. This natural maintenance of moisture in the mouth is of far greater value than the repeated applications of antiseptic solutions to the buccal cavity.

Lavage should never be omitted and the stomach should be carefully emptied of its acid contents and washed out with an alkaline solution every six hours, after which it is often a good plan to introduce 6 ozs. of warm water containing 60 to 90 grains of carbonate of bismuth in suspension

into the organ through the tube. The only other drug which is of any value in gastric intolerance is morphine, either in the form of hypodermic injection, or of tincture of opium, ten drops of which may be added to each enema.

(2) *Hæmorrhage* must be combated upon the same lines as in cases of gastric ulcer. The patient remains in bed and is fed entirely by the rectum in the manner just described. An ice-bag may be applied to the epigastrium. As a rule, a pill containing ½ grain of the extract of opium and 3 grains of gallic acid is of greatest value in checking the bleeding, but in some instances a solution of adrenalin chloride or a decoction of suprarenal extract is also of use.

(3) *Tetany* is a very fatal complication of hypersecretion and demands immediate treatment. Absolute rest in bed and complete abstention from food are essential, and the nutrition should be maintained by enemata of peptonized milk. It is rarely wise to employ a tube for the purposes of lavage, since the introduction of the instrument is apt to excite a fresh convulsion.

As soon as the patient has been free from the spasm for a week the question of gastro-jejunostomy should carefully be considered, since in most of these cases stenosis of the pylorus or duodenum exists, and unless an accessory opening be established between the stomach and the bowel, the tetany is sure to recur and eventually to prove fatal.

Surgical Treatment.—For many years careful medicinal treatment may suppress the more important symptoms of chronic hypersecretion and permit the patient to enjoy a fairly comfortable existence. Sooner or later, however, in spite of lavage and a strict dietary, the results of gastrectasis steadily increase and dangerous complications occur. Out of several thousand examples of the disease which have come under my care I can hardly recall a case in which a true cure can be said to have been established; while in a large percentage death ensued within twelve years from

hæmorrhage, perforation, appendicitis, inflammation of the pancreas or gall bladder, progressive asthenia, tetany, diabetes, or from an intercurrent disease, such as pneumonia or tuberculosis.

I therefore always warn the patient's friends and his medical attendant that the question of surgical treatment should be kept prominently in mind despite any apparent amelioration of the symptoms. The cases which, in my opinion, demand immediate operation are those in which severe nocturnal pain, vomiting, and evidence of food retention have not yielded to lavage and medical treatment, or recur in spite of it. In the majority, a chronic ulcer of the duodenum or pylorus will be found on exploration, and the performance of gastro-jejunostomy is attended by immediate and excellent results. Ulcers situated in the central zone of the stomach or near the cardiac orifice rarely respond in a satisfactory manner to the operation, while excision of the ulcerated surface is a dangerous procedure in cases which have long suffered from the effects of chronic inanition and should only be undertaken by experienced surgeons. It has been stated that gastric hypersecretion invariably disappears after successful gastro-jejunostomy ; but careful examination of the gastric contents in such cases almost invariably proves that the stomach never really loses the habit of excessive secretion, especially if the pylorus was invaded by an ulcer or its cicatrix, and the occasional development of a secondary jejunal ulcer is a striking testimony to this fact.

Gall-stones which induce severe hypersecretion are rarely attended by colic or jaundice, owing to the fact that the calculus is usually single and of considerable size ; but the condition is frequently followed by ulcer of the duodenum or stomach. In uncomplicated cases removal of the gall-bladder is usually followed within three months by subsidence of the hypersecretion, but the appendix must always be

examined and excised if it shows any signs of disease. When pyloric stenosis complicates cholelithiasis, it is advisable to perform gastro-jejunostomy. Since the publication in 1910 of my original paper upon latent appendicitis as a cause of gastric hypersecretion, and also those by Moynihan and Paterson dealing with appendicular disease and indigestion, medical practitioners in this country seem to have assumed that appendicitis is one of the principal causes of dyspepsia, with the result that appendicectomy is almost invariably recommended as a cure of indigestion, quite irrespective of its nature and origin. Apart from the comparative rarity of true appendicular hypersecretion, it is not yet appreciated that even in genuine cases the mere removal of the diseased appendix rarely cures the secondary dyspepsia, while the frequent existence of such complications as gall-stones or ulcer of the stomach or duodenum completely nullifies the good results which might have been expected from the operation unless these secondary diseases are dealt with at the same time. Further experience has led me to modify many of the views I held in 1910, and to-day I never advise appendicectomy with the expectation of curing chronic hypersecretion, but rather with the view of eliminating the danger of appendicitis in the future and of the possible prevention of duodenal ulcer or other sequelæ of the secretory disorder.

Another reason why appendicectomy so often fails to relieve gastric hypersecretion is that the disease of the appendage is a *secondary* and not a *primary* complaint. At least 80 per cent. of all varieties of chronic hypersecretion are affected sooner or later by inflammation of the colon which involves the appendix, and although removal of the organ in such cases may possibly prevent serious appendicitis in the future, the operation exerts no beneficial effect either upon the gastric disorder or upon the colitis. For these reasons I strongly deprecate indiscriminate recourse to

appendicectomy *as a cure for indigestion*, and regard such a practice not only as unscientific in conception but productive of much disappointment to the patient and injurious to the reputation of the profession.

3. ACHYLIA GASTRICA

(Synonyms—Hyposecretion ; Hypoacidity ; Subacidity ; Anacidity ; Anachlorhydria)

The antithesis of the preceding forms of dyspepsia which depend upon excessive secretion of gastric juice is a disorder of digestion due to a deficiency of hydrochloric acid. This failure of physiological function is met with under many and diverse conditions and is usually a complication or sequela of organic disease of the stomach or other important organ of the body. Thus, the secretion of hydrochloric acid is either greatly diminished or entirely abolished in all acute and chronic inflammations of the stomach from whatever cause they may arise, and hyposecretion is also encountered in many cases of chlorosis, diabetes, phthisis, Bright's disease, chronic dilatation of the heart, prostatic enlargement, slow-growing carcinoma of the breast, and tubercle of the adrenal glands. The symptoms that ensue from these varieties of subacidity will be discussed later under their appropriate titles (Chaps. IV, VIII, IX). Free hydrochloric acid also disappears during the course of gastric carcinoma, and whenever the peptic glands are affected by atrophy or lardaceous disease. A *temporary* failure of the secretion is occasionally met with in neurotic and hysterical individuals, in whom a sudden mental or physical shock will entirely suppress the gastric secretion for many hours or even for days. Apart, however, from these various conditions where hyposecretion is a result of another disease, there exists a well-defined though rare complaint which is characterized by an almost complete

inhibition of the gastric secretion, and consequently of the digestive functions of the organ, but which is not associated with any demonstrable disease. This peculiar disorder is termed *Achylia Gastrica*, and in most of the recorded cases was regarded as congenital in origin (Einhorn, Martius).

Symptoms.—It is customary to distinguish three clinical varieties of achylia gastrica, according to the presence or absence of certain subjective phenomena, but it is quite possible that the three groups merely represent successive stages of the complaint. In the first, the patients experience no abnormal symptoms whatever, and, if it were not for the gastric analysis they would be regarded as individuals in perfect health. In the second class, indications of a mild disturbance of the stomach are accompanied by symptoms of intestinal indigestion; while in the third, chronic intestinal indigestion is the predominant feature of the case.

Achylia gastrica without symptoms must be regarded as a rare disorder, although typical examples have been recorded by Einhorn, Martius, Ewald, Allen Jones, D. Stewart, and others. Medical advice is usually sought on account of neurasthenia or some other malady unconnected with the digestion; and it is only upon investigation that the gastric secretion is discovered to be absent. Cases of this description often recover from the nervous complaint and remain in good health for many years, despite the lack of an active gastric juice; but it is probable that sooner or later they develop some derangement of the intestines. According to Martius, this latent variety is often congenital, but my own investigations seem to show that in some instances, at any rate, the achylia is the result of partial atrophy of the stomach induced by the gastritis of infancy.

When the symptoms of gastric dyspepsia coexist with those of an intestinal disturbance, the case closely resembles

one of neurasthenia of the stomach. In such, discomfort and oppression at the chest are experienced soon after each meal, and the patient is unable to take much food owing to the feeling that the capacity of his stomach is limited. The appetite is diminished and capricious, the bowels are irregular in their action, and nausea is apt to occur after exertion. Nervous depression is always present without apparent cause, and the patient feels unfit for any work, whether mental or physical. The urine is abnormally acid, and fails to exhibit the alkaline phase that usually ensues during the period of gastric digestion, while a copious deposit of uric acid often occurs after it has been allowed to stand for a short time.

In the *intestinal form* of the complaint any gastric symptoms which may exist are masked by those arising from the bowels. Flatulence and abdominal distention are more or less constant, and an evacuation may ensue after each meal. In other instances diarrhœa is present, and the food appears in the stools in an undigested condition within a few hours of its ingestion. Griping pains in the belly, fullness of one or other hypochondrium, irritability of the bladder, and the frequent passage of flatus are common subjects of complaint. Occasionally the stools are liquid, frothy, and foul-smelling, or they contain an excess of mucus or altered bile. Inflammation of the duodenum is accompanied by gurgling, nausea, vomiting, pain in the right hypochondrium and occasionally by severe diarrhœa and jaundice (Oppler).

In the first two forms, or stages, of the complaint the general nutrition remains unaffected, but when diarrhœa sets in the patient gradually loses flesh and strength and develops signs of anæmia. It is uncertain at present what effect the disease exerts upon the duration of life.

Chemistry of Digestion.—Analysis of the contents of the stomach shows that the various constituents of the meal

present no signs of digestion. The material extracted from the stomach is also abnormally dry and devoid of mucus; the former feature being due to the absence of secretion and the latter to failure of the mucus-secreting cells of the gastric epithelium.

The total acidity of the filtrate usually varies from 2 to 6, but occasionally the extract is neutral in reaction. Free hydrochloric acid is invariably absent, and the combined acid either exists only in minute quantity or is altogether wanting. The amount of pepsin and rennet varies with the degree of acidity: as long as hydrochloric acid is secreted the filtrate continues to exhibit slight digestive properties, but when it is suppressed the ferments also disappear. Neither peptone nor propeptone can be detected, but occasionally sugar and erythrodextrin may be found in the filtrate. Lavage of the stomach with a weak solution of hydrochloric acid may produce a fluid which presents slight powers of digestion.

In the early stages of the complaint the motor power of the stomach is unaffected or may even be somewhat increased, but when intestinal symptoms develop motor insufficiency and gastrectasis usually ensue.

Von Noorden has shown that the intestine is capable of assuming all the functions of the stomach when that organ is deprived of its secretory powers without impairment of motility; but that as soon as the stomach begins to suffer from motor insufficiency the introduction of fermenting food into the bowel causes derangement of intestinal digestion. These facts serve to explain the absence of dyspepsia in many cases of achylia, and also the coexistence of gastrectasis when the symptoms of intestinal indigestion are present.

Diagnosis.—The diagnosis of achylia rests upon the discovery on several successive occasions of absence of hydrochloric acid with a corresponding deficiency of the ferments.

The total suppression of the gastric secretion in a case that exhibits neither gastrectasis nor motor insufficiency, and in which no organic disease exists in the other organs of the body, indicates the presence of achylia.

As a rule the X-rays show the stomach to be normal in size and hypertonic, so that it empties itself more rapidly than normal; but at a later stage, when gastrectasis or gastritis complicates the disorder, the passage of food into the intestine is delayed and much fermentation may be observed.

Treatment.—So long as the patient suffers no ill effects from the absence of gastric activity, it is only necessary to prescribe a form of diet which shall not unduly distend or embarrass the stomach, and to treat, as far as possible, any nervous condition which may appear to be responsible for the disorder. As a rule, the diet should be a mixed one, and the meals should be taken every three hours. Milk, eggs, fish, sweetbread, tripe, calf's head, and sheep's brains are easily digested by the intestine, while sago, macaroni, tapioca, and rice may also be given in moderation. Well-cooked spinach, turnips and cabbage may be allowed as well as a little stewed fruit. On the other hand, salads and tomatoes and other raw vegetables are apt to disagree. If the appetite is deficient, the various artificial foods which have undergone partial digestion may be given, and cod-liver oil and the extract of malt are sometimes very useful. Catarrhal conditions of the intestine must be treated carefully, and the patient should take special precautions against cold. Hydrochloric acid is the most useful drug, and may be given in doses of 15 to 20 minims, diluted with an ounce or two of water, after each meal, but sometimes draughts of warm water containing hydrochloric acid (1 in 1,000) are of greater value. In some instances pepsin, the peptenzyme tablets, pepsencia or lactopeptine may also be employed with advantage, but pancreatin, which from

a theoretical point of view would appear to be especially indicated, is rarely of any use. Metchnikoff's sour milk should always be given a trial.

When motor insufficiency develops, lavage with warm water should be performed each day, and massage and electricity may be tried. Mineral waters often do more harm than good by producing distention of the stomach and thus predisposing to atony.

CHAPTER III

DYSPEPSIA DUE TO FAILURE OF THE MUSCULAR POWER OF THE STOMACH

MYASTHENIA GASTRICA

(Synonyms—Atony; Motor Insufficiency)

By the term gastric myasthenia is understood a diminution of the elasticity and contractile power of the muscular coat of the stomach, whereby the organ is rendered unduly distensible and is prevented from emptying itself within the normal period of time.

Frequency.—Myasthenia is a perversion of the digestive functions which constitutes one of the most frequent causes of dyspepsia in this country. According to my hospital statistics, the condition was encountered in 32 per cent. of all cases of indigestion, while in my private practice its percentage frequency was 5·2.

Sex.—Women are far more liable to the complaint than men, the ratio of the two sexes in my cases being nearly 3·5 to 1. The complaint occurs at all periods of life, being a common cause of dyspepsia in growing children and almost a natural sequence of old age.

Age.—The age at which the first symptoms of the disorder manifest themselves varies according to the sex of the patient, women being most prone to the disorder between fifteen and thirty, while men chiefly suffer from it between thirty and fifty years of age.

THE AGE-INCIDENCE OF MYASTHENIA GASTRICA IN MEN AND WOMEN (ALL CASES)

Age . .	10–20	20–30	30–40	40–50	over 50	Total
Males . .	13·5	16	25	25·5	20	100
Females .	26·4	24·4	15·8	14·4	19	100

Heredity.—From the earliest time writers upon diseases of the stomach have observed that certain families exhibit a marked tendency to " weak digestion," and have expressed their belief that atonic dyspepsia is a disorder that is transmitted from one generation to another. Careful inquiry has convinced me that in nearly 42 per cent. of all cases of primary myasthenia one or other of the parents will be found to have suffered in a similar manner, and that in three cases out of four (75 per cent.) the predisposition to the complaint is inherited from the mother. As might be expected, persons who possess an *inherited tendency* to the disorder usually develop it at a comparatively early period of life, and in this connexion it is interesting to observe that, as a rule, men fall victims to it at an earlier age than women.

THE AGE-INCIDENCE OF MYASTHENIA GASTRICA IN PERSONS WHO POSSESS AN HEREDITARY TENDENCY TO THE COMPLAINT

Age . .	10–20	20–30	30–40	40–50	over 50	Total
Males . .	33	31	32	4	0	100
Females .	28	31	22	19	0	100

It is interesting to observe that myasthenia is far more

common in persons of tall stature and spare habit of body than in those who are comparatively short and stout. Thus, among several hundred dyspeptics of average height who were specially investigated with regard to their weight, 62 per cent. of those who had always scaled less than ten stone were found to be the subjects of this disorder, while only 37 per cent. of those who habitually weighed more than twelve stone suffered from the complaint.

Etiology.—For the purposes of etiological description it is convenient to recognize two varieties of gastric myasthenia —the primary and secondary.

Primary Myasthenia.—The quantity and quality of the food are most important factors in the production of the complaint. The habit which is so prevalent of indulging in a large meal three or four times a day tends to over-distend the stomach and to tax to the utmost its motor and secretory functions. For a time this increase of work calls forth a corresponding increase of power, and the individual remains free from indigestion despite his apparent efforts to induce it; but sooner or later the power of compensation begins to fail, the stomach is no longer able to empty itself within the normal period of time, and motor insufficiency develops. In other cases the organ continues to perform its functions in an efficient manner until an attack of fever or the occurrence of disease in some other important viscus injuriously affects the musculature, when the contractility of the stomach suddenly fails and indications of myasthenia manifest themselves. Not infrequently indulgence in an excess of milk with the view of improving the general nutrition is immediately responsible for the development of atonic dyspepsia, and consequently many sufferers from the disorder refer the onset of their symptoms to the time when they underwent a "rest cure." Meals taken at short intervals, even when they are composed of easily digestible substances in moderate quantities, tend to

exhaust the muscular power of the stomach by interfering with its necessary periods of rest, and it is probably on this account that growing children, who are forced by anxious but injudicious mothers to take nourishment every two hours, so frequently fall victims to motor insufficiency.

Many writers regard the use of animal food as particularly prejudicial to the muscular integrity of the digestive organs, but according to my experience meat is far less harmful in this respect than a diet which is largely composed of liquids, starches, or vegetables. Thus, among a series of dyspeptics who had never indulged in animal food more than once a day, and often only twice a week, nearly 70 per cent. were found to be suffering from gastric myasthenia, while of those who were in the habit of taking meat two or three times a day only 49 per cent. were affected in a similar manner.

Conversely, nearly 75 per cent. of the dyspeptics who declared that they subsisted entirely upon a vegetable diet were found to be suffering from atony of the stomach. These facts amply corroborate the statement previously made, that meat eaters are chiefly liable to disorders of secretion (hyperacidity, etc.), while those who live upon substances which throw the chief stress of digestion upon the intestines are particularly prone to motor derangements of the stomach. All beverages, when taken to excess, are apt to induce an enfeeblement of the muscular coat of the viscus, especially the aerated waters whose gases, when expelled by the heat of the body, give rise to distention and stretching of the gastric walls.

But of all beverages strong tea is the most deleterious, and its influence upon the causation of myasthenia is particularly apparent among the lower classes, who allow a strong infusion to stand for many hours and imbibe it at short intervals. Thus, out of a hundred seamstresses, laundresses, and dressmakers, who admitted that they

habitually drank strong tea to excess, no fewer than fifty-eight presented the symptoms and signs of myasthenia, while of those who indulged in both tea and coffee the percentage frequency of the disorder was 86. Coffee taken alone is more often productive of hyperacidity than of atony, since of those who restricted themselves to this beverage only 27 per cent. were found to be suffering from atonic dyspepsia.

Alcoholic liquors are not directly provocative of atony, and it is only when their abuse has occasioned chronic gastritis that fermentation of the food and the spread of inflammation to the muscular tunic give rise to motor insufficiency.

Prolonged abstention from food or deprivation of proper nourishment is occasionally responsible for gastric myasthenia, and in this connexion it is interesting to note that Bidder and Schmidt found by experiment in animals that the gastric juice became greatly diminished as the result of starvation.

Insufficient exercise, especially if it be associated with defective ventilation, is frequently responsible for the development of the complaint, and consequently persons who pursue their occupations in small and stuffy rooms are inordinately subject to it. Among a series of dyspeptics who were classified according to their occupation, it was found that myasthenia existed in 13 per cent. of those whose work confined them to the house or factory. Again, when the indoor occupation was of a sedentary character the percentage frequency of the complaint was 37, but when the employment was of a laborious description it was only 21. According to Samuel Fenwick, a constrained posture during work neutralizes the beneficial effects of muscular exertion, since he found that among miners of coal and lead nearly 42 per cent. suffered from motor insufficiency.

Persons whose calling compels them to reside for a long time in hot and relaxing climates are particularly apt to suffer

from gastric myasthenia, and children who are born under these conditions frequently develop the complaint at an early period of life. In other cases, again, the disorder appears to arise from a depressed state of the nervous system, and it is therefore unduly frequent among those whose business throws a continual strain upon the mind, who are exposed to constant worries of a financial or domestic nature, or who suffer from the want of a healthy or engrossing occupation.

The prolonged use of certain drugs is occasionally responsible for an atonic condition of the digestive tract. Thus, the injudicious administration of mercury and iodide of potassium in cases of syphilis, of digitalis in cardiac disease, of quinine and arsenic in malaria or nervous disorders, and of salines in constipation, is particularly injurious, while painters and others who constantly absorb small quantities of lead usually exhibit signs of myasthenia prior to the onset of the more striking symptoms of plumbism. The abuse of narcotics is another frequent though often unsuspected cause of the complaint ; large doses of bromides, morphine, codeine, cocain, sulphonal, trional, or paraldehyde being often responsible for the feeble digestive powers that are so often associated with persistent insomnia. Boracic acid and borax when employed as preservatives of milk and other forms of food exercise an inhibitive influence upon the secretory functions of the stomach and pancreas, which is apt to be followed by atony, while a similar effect is sometimes produced by the artificial colouring and sweetening agents with which articles of food are so often adulterated at the present day.

Much has been written concerning the injurious effects of smoking upon the processes of digestion, and Bouveret states that over-indulgence in the habit is a fruitful cause of myasthenia gastrica. On the other hand, careful inquiries made among a large number of dyspeptics do not corroborate our preconceived notions on the subject ; and as far back as

the middle of last century Samuel Fenwick remarked that " in no part of these inquiries (into the causation of dyspepsia) have I been more surprised than at the results obtained respecting the smoking of tobacco. I expected no difficulty in proving the noxious influence of the habit on digestion ; and it was only after carefully interrogating the facts in every way that I abandoned my preconceived opinion."

In the first place, as regards the relative incidence of dyspepsia among smokers and non-smokers respectively, my tables show among healthy men who had habitually smoked for many years, 49 per cent. had never suffered from dyspepsia and 51 per cent. were more or less subject to the disorder ; while among life-abstainers from the weed 52 per cent. possessed perfect digestions and 48 per cent. were liable to dyspepsia. Again, among pipe smokers the use of tobacco up to 5 ozs. a week does not seem materially to influence the liability to indigestion. Thus of those who smoked less than 3 ozs. a week 51 per cent. suffered from dyspeptic symptoms and 49 per cent. were healthy ; while of those who indulged in 3 to 5 ozs. a week, 56 per cent. were dyspeptic and 44 per cent. were healthy.

As in the case of other drugs, the effects of nicotine depend to a great extent upon its mode of administration and individual idiosyncrasy. Thus, many persons suffer no ill effects as long as they confine themselves to some special brand, but whenever they smoke cigars or indulge in a stronger form of tobacco, they are at once attacked by indigestion. Inhalation and chewing are infinitely more injurious to the digestive functions than oral smoking, and these habits are often the unsuspected cause of intractable dyspepsia, especially in women. When smoking gives rise to indigestion, the gastric disorder is more frequently found to depend upon inflammation or hyperchlorhydria than upon primary myasthenia, the relative proportions of the three complaints in every hundred cases

of "tobacco dyspepsia" being approximately: hyperchlor-acidity fifty-four, gastritis thirty, and myasthenia sixteen.

Finally, myasthenia of an acute type and short duration occasionally ensues as the result of a strong emotion or a physical shock, such as a blow upon the abdomen during the period of gastric digestion or cerebral or spinal concussion.

Secondary Myasthenia.—Myasthenia of secondary origin is far more common than the primary form of the complaint. Almost every severe case of *anæmia* or *chlorosis* is accompanied by an enfeeblement of the motor power of the stomach, and nearly 18 per cent. of the cases of atonic dyspepsia which are met with in hospital practice in London occur in anæmic women. Next in order of frequency are general neurasthenia and those debilitated constitutional conditions that arise from continued suppuration, leucorrhœa, bleeding piles, menorrhagia, and metrorrhagia, while in both sexes the practice of excessive masturbation is a common cause of the disease. Chronic constipation is almost invariably associated with an atonic state of the stomach, and no permanent relief is afforded to the gastric symptoms until the action of the bowels has been efficiently regulated.

Diseases of the heart, lungs, and liver which embarrass the portal circulation and give rise to chronic congestion of the gastrointestinal tract are always accompanied by indications of myasthenia, and a similar effect is sometimes produced by chronic enlargements of the spleen.

Chronic gastritis, whatever be its cause, is almost invariably followed by atony, and in many instances the symptoms of the two complaints alternate regularly with one another. In such cases the inflammation of the mucosa spreads into the muscular coat of the organ along the connective tissue that surrounds and supports the bundles of muscle-fibres, and its organized products tend not only to hamper the contractility of the tissue, but may lead to the destruction of a

considerable portion of its structure. For a similar reason chronic ulcer, cancer, atrophy, lardaceous degeneration, and other organic affections of the stomach are always attended by myasthenia, while in such functional disorders of the viscus as hypersecretion and neurasthenia, as well as in cases of gastroptosis and foreign bodies, many of the most prominent indications of the complaint are due to the coexistence of atony. Pulmonary tuberculosis is attended by atony of the stomach from an early stage.

Myasthenia frequently develops during the convalescent period of such specific febrile diseases as influenza, measles, scarlatina, pneumonia variola, and enteric fever, its incidence being encouraged by the excess of milk and other forms of fluid nourishment with which the patient is fed.

Many writers have noted the relationship of myasthenia gastrica to biliary lithiasis, and my own experience leads me to believe that more than one-third of the cases which come under treatment for gall-stones have previously suffered from atony of the stomach and intestine.

Disease of any abdominal organ which is invested by peritoneum may produce myasthenia by a process of reflex irritation. In most instances of this kind the mischief is located in the pelvic viscera, and consists of displacement of the uterus, inflammation of the tubes or ovaries, endometritis, or a prolapsed and tender ovary. In like manner local peritonitis in any part of the abdominal cavity may be followed by atony of the stomach (Wertheimer, Hennart), and Peter has even observed the digestive disorder as a complication of diaphragmatic pleurisy.

Symptoms.— The myasthenic stomach is essentially a lazy stomach ; its movements are sluggish, the food becomes slowly and often imperfectly mixed with the gastric secretion, and the expulsion of the semi-digested material into the intestine is much retarded. If due allowance be made for these peculiarities and the diet be carefully regulated, the

organ will continue to discharge its functions in a fairly efficient manner; but if any attempt be made to impose additional work upon the viscus, retention and decomposition of the food will ensue, and be accompanied by indications of gastric dilatation.

As in the case of many other disorders of the digestive organs, a considerable period may elapse between the establishment of the morbid condition and the occurrence of subjective symptoms, and many patients will consequently exhibit the physical signs of gastric myasthenia for months or even years before they themselves become conscious of its existence. The non-appreciation of these facts has led to much confusion in the symptomatology of the disease, for the majority of writers either make no distinction between myasthenia and its resultant gastrectasis, or distinguish two varieties of the complaint—the mild and the severe—according as food stagnation or food retention constitutes its most prominent feature. In order to appreciate fully the protean character of the complaint it is necessary to consider in detail the three successive stages which are presented by the disorder, namely, the latent period, the stage of food stagnation, and the stage of food retention.

(1) The Latent Stage.—A period during which the characteristic symptoms of myasthenia are absent exists in nearly 20 per cent. of all cases, and is most frequent in persons who possess a highly nervous temperament and an hereditary predisposition to the complaint. In such individuals the appetite continues good and the general health may be excellent, but at irregular intervals, and especially when they have overeaten themselves or have indulged in some article of diet that habitually disagrees, they suffer from a sensation of weight or oppression at the chest, which comes on about an hour after the meal and is accompanied by abdominal distention, flatulence, and languor. These

symptoms usually subside within a few hours and may not recur for many weeks, but as a rule the attacks tend to make their appearance at short intervals and upon the least provocation until eventually discomfort after meals becomes an established phenomenon. This latent stage, which usually lasts for several months or even years, helps to explain many of the so-called "acute" cases of gastric myasthenia, since it is obvious that an individual who already possesses an atonic stomach, although unconscious of its existence, will readily become the subject of definite manifestations if he be exposed to physical violence, severe psychic influences, or be attacked by a febrile malady.

(2) The Stage of Food Stagnation.—Whether the disorder be preceded by a prolonged latent period or commence in a more abrupt manner, the symptoms that portray its existence are always characteristic and of sufficient importance to attract attention.

Discomfort during the period of gastric digestion is usually the most constant and prominent feature of the case, but it varies greatly in severity under different conditions. As a rule, it commences soon after the ingestion of food, and reaches its acme within an hour and a half, after which it either gradually subsides or is rapidly removed by the eructation of a large quantity of gas. The sensation is usually described as one of weight, fullness, or oppression, and not only affects the upper part of the abdomen, but is often more particularly felt behind the sternum, in the left axilla, or between the scapulæ, while not infrequently the skin below the left breast becomes hyperæsthetic or is the seat of a burning pain. When myasthenia is associated with gastroptosis the maximum discomfort is usually located in the umbilical or hypogastric region. These subjective phenomena are almost invariably accompanied by abdominal distention, which proves so uncomfortable as to necessitate loosening of the clothing. The discomfort varies in degree according

to the nature and quantity of the food, and in mild cases may only be experienced after the principal meal of the day. Sooner or later, however, every attempt to partake of food is followed by distress, and the only time when the patient is free from discomfort is when the stomach is empty.

In most cases it may be observed that liquids are more deleterious than solids, and that indulgence in a cup of tea or even a glass of water is followed by as much distention as a moderate meal. In like manner, soups, broths, or a diet of milk invariably induce an abnormal degree of distention, while mineral waters, owing to the gas they contain, always occasion severe flatulence. Another characteristic phenomenon is the apparent limitation of the capacity of the stomach. Thus many subjects of gastric myasthenia will remain comparatively free from indigestion so long as they follow a rigid diet and carefully restrict the amount of food taken at each repast; but whenever they indulge their appetite they at once experience a sense of over-distention and suffer from a recrudescence of all their former symptoms. Next to liquids, green vegetables, fruit, and farinaceous substances produce the greatest discomfort, while occasionally overcooked meat, oily fish, and eggs also prove difficult of digestion. Distention and eructation in the early morning are frequently met with in cases of myasthenia secondary to gastritis, chlorosis, or gastroptosis, but in the primary form of the complaint these symptoms are rarely experienced when the stomach is devoid of food. Unless the disorder is complicated by hyperchloracidity or hypersecretion, the further indulgence in food during the persistence of the gastric symptoms invariably increases the discomfort.

Gaseous eructations occur in every case and usually constitute one of the chief causes of complaint. As a rule, the belchings ensue within an hour of a meal, and are especially

severe after the ingestion of fluids. They are often accompanied and occasionally replaced by hiccough. As a result of the eructation small quantities of semi-digested food, of a sweet or slightly acid taste, are forced into the mouth with the escaping gas. Examination of the eructated gas shows that it consists for the most part of atmospheric air that has been swallowed with the food mixed with small quantities of carbon dioxide and hydrogen generated during the process of digestion. It is also probable that the carbonates of the saliva yield a certain quantity of carbonic acid gas as the result of their decomposition by the acid gastric secretion, while in some instances, at any rate, the patulous condition of the pyloric sphincter permits the regurgitation of the alkaline contents of the intestine which undergo similar changes. True fermentation of the food seldom occurs at this stage of the disease.

Vomiting is rarely encountered, but sometimes emesis is excited by the insertion of the finger into the throat with the object of securing relief from indigestion. Acid regurgitations are also never met with in uncomplicated cases.

The *appetite* may remain unaffected for a considerable time, but sooner or later it undergoes gradual diminution. The desire for food is easily satisfied, and although the patient may sit down to a meal with every expectation of enjoying it, he suffers from a sense of satiety after a single course or even a few mouthfuls, while a moderate meal gives rise to a sense of repletion. Occasionally there is a marked distaste for all forms of food, even when prolonged abstinence has given rise to exhaustion, or special avidity is displayed toward such articles of diet as sour oranges, lemons, acid drinks, or pickles. When myasthenia occurs as a complication of hyperchloracidity the appetite is usually increased, and many of the uncomfortable sensations that ensue during the course of digestion are immediately relieved by the further ingestion of food.

Thirst never exists, and in most instances there is an actual aversion to fluids, owing probably to the fact that they increase the dyspeptic symptoms.

The large intestine always shares the myasthenic state of the stomach, with the result that *constipation* is an invariable accompaniment of the disorder. The stools are hard, dry, colourless, and often scybalous in appearance, and their evacuation is sometimes followed by irritation of the anus. Piles, fissure, and slight prolapse of the rectum may also occur. Offensive evacuations are rarely observed unless the diet contains an excess of meat. When gastroenteritis complicates myasthenia, attacks of diarrhœa are apt to alternate with periods of constipation.

The habitual stagnation of the intestinal contents favours the liberation of gases, which stretch the feeble muscular coat of the bowel and further diminish its contractility; hence circumscribed swellings often make their appearance in the region of the cæcum, hepatic, splenic, or sigmoid flexures, and produce a sensation of fullness or dragging accompanied by noisy borborygmi. At other times distention of the transverse colon gives rise to severe pain in the dorso-lumbar region of the spine or at the insertion of the diaphragm into the ribs, which may simulate that of lumbago, pleurisy, or renal colic.

The *tongue* is broad, pale and flabby; clean or slightly furred, and usually indented along its margins by the teeth. The inner side of the lips and gums is pallid and sometimes spongy in appearance; the tonsils are often enlarged, the uvula and pharynx are anæmic, and huskiness of the voice is apt to supervene toward evening and to be accompanied by constant efforts to clear the throat. An offensive smell of the breath and skin, rapid decay of the teeth, painful aphthous ulceration of the tongue and gums, and attacks of salivation are also occasionally encountered.

At first the *general health* is well-preserved and there is

no loss of weight; but in the course of time the patient develops an habitual languor and difficulty of mental concentration, exhibits a strong disinclination to any form of exertion, mental or physical. An unconquerable drowsiness is often experienced after meals, which, when yielded to, affords a heavy, unrefreshing sleep. The complexion is pale and sallow, there are dark lines beneath the eyes, the hands and feet are cold and clammy, and profuse perspirations occur after exercise or the least excitement.

The *pulse* is weak, soft, and easily compressible and is often unduly slow during repose, but easily excited by movements of the body. Palpitation is a constant and troublesome symptom in many cases, especially in neurotic and neurasthenic individuals. It is most pronounced after meals, and is frequently, though not always, traceable to flatulent distention of the stomach or bowel. Another phenomenon with which it is often associated is a form of dyspnœa that supervenes during the first hour of digestion. In this condition the patient experiences great difficulty of drawing a full breath, and each effort to inflate the lungs is followed by a long, sighing expiration. Occasionally a seizure very similar to asthma (asthma dyspepticum) ensues after the principal meal of the day, and is accompanied by cardiac irregularity, cyanosis, and even by partial collapse.

The *urine* is but little affected. It is clear, fairly copious, and deposits phosphates on standing. The temperature of the body is usually subnormal.

Physical Signs.—During the stage of food stagnation the stomach is not dilated, and since there is no obstruction to the passage of its contents into the duodenum the usual indications of gastric hypertrophy are absent. Consequently, the various methods of determining the size of the organ fail to indicate any permanent enlargement, and no peristaltic movements are visible upon inspection of the abdomen. It is only when the stomach is dislocated down-

ward or distended with gas that its outlines become apparent to the naked eye.

The chief signs of gastric myasthenia at this stage of the complaint are: (1) the persistence of splashing during digestion; (2) the retention of food beyond the ordinary physiological limit; (3) an undue distensibility of the gastric walls.

(1) Much misconception exists concerning the significance of *splashing* or "clapotage" on palpation of the stomach, some writers believing it to be pathognomonic of myasthenia while others attach little or no importance to its presence. It will be interesting, therefore, to notice a few facts with regard to this phenomenon.

Splashing sounds elicited by manipulation of the abdomen are due to the presence of gas together with liquid in a cavity or hollow viscus. They are accordingly met with in cases of subdiaphragmatic abscess when the sac contains both pus and gas, in gastric dilatation, in gastroptosis accompanied by myasthenia, in myasthenia of the stomach during the entire period of digestion, and in atony of the colon if the intestine happens to contain an excess of fluid. In healthy individuals the stomach splash can sometimes be detected within ten minutes of the ingestion of half a pint of fluid, and less frequently at the end of the digestion of a large meal, when a small amount of liquid chyme still remains in the organ. At all other times the contraction of the stomach is too firm to allow the phenomenon to occur, while the liquid imbibed with the food rapidly finds an exit into the duodenum. Again, under pathological conditions there is a great difference in the ease with which the splash can be obtained; in some instances deep palpation and repeated efforts being required to elicit the sound, while in others the lightest stroke of the finger or the least movement of the patient's body is sufficient to produce it. The area of the abdomen over which the sound can be produced

is also a matter of importance, since in healthy persons who have just imbibed a glass of effervescing water succussion can only be detected by palpation over the upper epigastrium and left hypochondrium, while in cases of dilated stomach the sound may be audible over the greater portion of the abdomen, the lowest point at which it can be obtained marking the position of the great curvature.

Finally, a splash, exactly similar to that produced in the stomach, occasionally arises from the presence of gas and liquid in the transverse colon. This fact, which was often commented upon in the writings of Samuel Fenwick, Lebert, and Wilson Fox, has been more recently insisted upon by Chomele; while Debove and Rémond have recorded cases in which a succussion sound was present although the stomach had been emptied by a tube.

From these considerations it follows that a gastric splash, which can be obtained one hour or more after a meal, is a certain indication of impairment of the muscular power of the stomach, the duration of the phenomenon and the ease with which it can be demonstrated being roughly proportionate to the degree of motor insufficiency. In every case of myasthenia, whether primary or secondary, clapotage may be observed from the commencement of the meal until after the expiration of three or more hours, and in severe instances it may only be in the early morning that manipulation of the epigastrium fails to produce the characteristic sound.

(2) *Stagnation of the Gastric Contents.*—Many methods have been devised to demonstrate the existence of motor insufficiency, the oldest procedure being that of Leube, which tests the time occupied by digestion. When a healthy person is supplied with a meal consisting of half a pint of broth, 6 ozs. of beefsteak, 1½ ozs. of mashed potato, and a roll, the stomach is found to be quite empty at the expiration of seven hours. In cases of motor insufficiency, on the other hand, the passage of a tube seven hours after

the administration of such a test-meal will show that the stomach still contains undigested food, the amount of which is directly proportionate to the degree of muscular failure. This evidence of food stagnation is forthcoming in every instance of gastric myasthenia, and in severe examples, the stomach is only empty in the early morning. It is advisable to wash out the organ before the administration of the test-dinner, lest it contain the residue of some previous meal.

Ewald and Sievers recommended the administration of salol as a test of the motor power of the stomach, since this substance is unaffected by the gastric juice, but is rapidly split up by the alkaline fluids of the intestine into salicylic acid and phenol, the former of which is eliminated by the kidney and can easily be detected in the urine. When 15 grains of salol enclosed in a cachet are administered to a healthy individual the characteristic reaction of the urine (violet colour on the addition of neutral chloride of iron solution) can be detected within thirty to seventy-five minutes. If the reaction is delayed beyond the latter period it is obvious that the salol did not escape from the stomach within the normal time. Many writers have taken exception to this method (Decker, Riegel, Reale and Grande, Wotitsky), and Stein has shown that an excess of mucus in the stomach is capable of decomposing the salol, while occasionally the salt is absorbed by the gastric wall and decomposed in the circulation.

Huber employs the salol test for the purpose of determining the length of time during which salicylic acid persists in the urine. Thus he has found that in healthy subjects the reaction disappears after twenty-seven hours, while in cases of motor insufficiency the violet colour may be recognized after the expiration of thirty-six hours or longer. Winckler and Stein prefer iodipin to salol, since it is rapidly decomposed in the intestine with the liberation of free iodine

which is eliminated in the saliva. Under normal conditions the iodine can be detected in the saliva fifteen minutes after the iodipin has been swallowed, whereas in cases of diminished gastric motility it may not appear for several hours. It would, therefore, seem that if free iodine cannot be detected in the saliva at the end of forty-five minutes some degree of motor insufficiency exists. The oil methods of Klemperer and of Mathieu and Hallot have a certain amount of scientific interest, but as they involve considerable trouble and discomfort to the patient they are devoid of practical value.

The employment of the X-rays has quite superseded the methods formerly in use. After a bismuth meal the great curvature is seen to be unusually depressed and the peristaltic waves are comparatively infrequent and feeble, with the result that the organ empties itself slowly and imperfectly and its shadow may be detected six hours later, when no food has been taken in the interval.

(3) *Undue Distensibility of the Gastric Walls.*—This abnormal condition, the existence of which can be surmised from the flaccidity of the viscus and the imperfect manner in which it contracts upon its contents, may be demonstrated by a method introduced by Dehio. If the outlines of the stomach be carefully determined when the subject is in the erect position, it is found that after drinking a tumblerful of water the lower border of the organ will descend to a spot in the median line of the abdomen about 4½ inches below the lower end of the sternum. After a second glass it is usually 1 inch lower than after the first; a third glass will depress it another inch, and a fourth 1 inch further. Penzoldt, Weil, and other observers state that 2 quarts of water rarely depress the great curvature to the level of the umbilicus. In myasthenia, the atonic state of the gastric wall renders the viscus more easily distensible than under normal circumstances, and consequently a single glass

of water will usually depress the lower border of the stomach to the same extent as two glassfuls in a healthy person, while not infrequently a quart will be found to cause the great curvature to sink below the level of the umbilicus. The same phenomenon is observed when air is pumped into the organ.

Another method frequently employed is to distend the stomach with air or gas. Ninety grains of tartaric acid mixed with a similar quantity of bicarbonate of sodium yield 1700 c.c. of carbon dioxide at the body temperature and atmospheric pressure. The normal stomach rapidly filled has a volume varying from 800–1200 c.c.; but if the muscular tone of the stomach is impaired, it can easily accommodate 1700 c.c. of gas, and consequently when these salts in the quantities named are administered in separate doses to the subject of advanced myasthenia gastrica, little or no distress is occasioned and no special protuberance of the organ can be observed.

Chemical examination of the contents of the stomach after a test-meal shows no constant deviation from the state of health. In most cases the secretion of hydrochloric acid is normal and in many of the secondary varieties of myasthenia hyperchlorhydria is found to exist. It may also be demonstrated that the secretion is more prolonged than usual owing to the protracted evacuation of the chyme. Lactic acid and other products of fermentation are absent.

(3) The Stage of Food Retention.—Long-continued stagnation of food in the stomach exercises a serious influence upon the gastric functions. The prolongation of digestion curtails the periods of rest and tends still further to exhaust the muscular structure, while the delay in the transmission of the chyme into the duodenum favours the development of various forms of fermentation, with the result that the viscus becomes distended by gases which stretch its enfeebled walls and lead to dilatation of its cavity. It follows,

therefore, that myasthenia gastrica possesses an inherent tendency to terminate in dilatation of the stomach. In all cases the development of gastrectasis is a gradual process, and the symptoms of the second stage of myasthenia merge almost imperceptibly into those of food retention.

In this, the terminal phase of the complaint, the discomfort which was formerly experienced after meals becomes accentuated and also alters somewhat in character. Instead of liquids being chiefly responsible for the sense of weight and fullness in the epigastrium, the patient notices that solid and semi-solid articles of diet occasion genuine pain in the chest, abdomen, and back, and that a few mouthfuls will often destroy any desire for food which may previously have existed. At the same time additional distress is caused by severe distention of the stomach, which produces oppression at the chest, dyspnœa, palpitation, and sometimes giddiness and faintness, for the relief of which it may be necessary to loosen the clothing and to seek a recumbent posture. Gaseous eructations accompany these manifestations of distress, and although they afford a certain amount of relief, the desire to expel gas from the stomach may continue urgent for several hours. As the acid products of fermentation accumulate in the stomach, severe epigastric pain, somewhat similar to that met with in hyperchlorhydria, may be experienced, accompanied by eructations of an acid fluid which causes scalding pain in the pharynx and behind the sternum with an unpleasant taste in the mouth. The appetite is poor and becomes progressively less, and severe thirst may be experienced. Insomnia is commonly present at this stage of the complaint, and in the early morning the patient feels weak, tired, and depressed and may suffer from heavy frontal headache.

Nausea varies in severity in different cases, in some being a constant and distressing symptom while in others little or no sense of sickness is experienced even prior to an attack

of emesis. The most important indication of the development of gastrectasis is *vomiting*, which exists to a greater or lesser degree in every case. At first the accumulation of undigested and fermenting food is removed every third or fourth day by a copious sickness which affords great relief to the other symptoms, but in the course of time the vomiting tends to become more frequent and to occur three or four hours after the principal meal of the day. It differs from that which arises from pyloric obstruction in that it rarely ensues during the night, is less copious, and often fails to empty the stomach completely. The ejecta consist of a brownish, pultaceous, sour-smelling material, which imparts a sour or bitter taste to the mouth, and is often glutinous owing to its admixture with mucus. As in other varieties of gastrectasis, the vomit often separates on standing into three layers, the uppermost of which is frothy, the middle opaque, while the lowest consists of undigested food which may present a seething appearance owing to the rapid evolution of gas.

As a result of the maldigestion of the food and the frequent evacuation of the stomach, emaciation is a constant feature of the complaint, and the body weight may diminish by a pound or more each week. The skin also becomes dry and harsh, dandruff appears on the scalp, and the hair persistently falls out. The intestinal functions are always deranged sooner or later owing to the entrance into the bowel of undigested and fermenting food, with the result that the patient suffers frequently from colic or complains of a sense of weight and fullness in the lower part of the abdomen accompanied by constipation and the passage of foul gas. In long-standing cases the excreta are pale, dry, scybalous, and coated with mucus, while at intervals a form of spurious diarrhœa supervenes, in which the motions are entirely composed of slime and yeasty material. In rare instances membranous colitis ultimately develops.

Owing to deficient absorption from the stomach and the frequent emesis, the urine is diminished in amount and possesses a higher specific gravity than normal. Both the total acidity and the output of chlorides are markedly decreased, and a copious deposit of phosphates occurs on standing. When vomiting is an urgent symptom the breath and the urine often smell of acetone, and diacetic acid may sometimes be detected in the latter.

Almost every organ of the body suffers more or less severely from malnutrition and the effects of toxic absorption. Anæmia is invariably present ; the complexion is muddy and unhealthy, while not infrequently the skin of the trunk and extremities presents an erythematous or acneform eruption or is affected by eczema or pityriasis. The thickening and enlargement of the second phalangeal joints, which gives rise to pain and stiffness of the fingers, is considered by Bouchard to be characteristic of toxic absorption from the stomach.

Few sufferers from this gastric disorder escape symptoms referable to the heart and circulation, the most conspicuous of which are attacks of palpitation after meals, irregularity of the cardiac action, or tachycardia. In other cases asthmatic seizures supervene after meals or attacks of choking and suffocation occur during the night. When the colon becomes inflamed other mucous membranes are apt to be affected in a similar manner, and the symptoms of cystitis, cysto-pyelitis, pharyngitis, and postnasal catarrh may prove so troublesome as to distract attention from the original complaint. The hepatic functions are always disturbed by the presence in the portal system of the poisonous products of food decomposition, so that in addition to the unhealthy aspect of the stools, heaviness or pain in the right hypochondrium, a metallic taste in the mouth, an icteric tinge of the conjunctivæ and skin, and hæmorrhoids add considerably to the other causes of discomfort. Finally, ner-

vous phenomena are rarely absent, and most patients complain at one time or another of drowsiness and apathy after meals, headache, impairment of memory, and general lassitude, while in some cases tinnitus, difficulty of speech, weight and numbness of the extremities, muscular cramps, anginiform seizures, or even slight convulsions may occasion anxiety.

Physical Signs.—Inspection of the abdomen never reveals active peristalsis of the stomach, but the enlarged viscus may sometimes be detected by an abnormal protuberance in the epigastrium and umbilical regions. Occasionally the swelling undergoes rhythmic augmentation and diminution as the gases which are generated in the organ accumulate and are discharged into the bowel or eructated, and under these circumstances auscultation of the stomach will reveal a variety of bubbling and sizzling sounds produced by the gas escaping from the fermenting chyme.

Artificial distention and auscultatory percussion show the stomach to be somewhat enlarged and often dislocated downward owing to its increased weight, the lower border of the viscus reaching to the level of or below the umbilicus and the pyloric antrum to the right of the median line of the abdomen. As in the second stage of the complaint, splashing sounds may be elicited during the whole period of digestion, while owing to prolonged retention of food succussion may sometimes be obtained in the early morning.

The pathognomonic sign of motor insufficiency is the presence of food in the organ in the early morning after a test-supper. In order to obtain the most accurate information upon this point, the stomach should be washed out at 7 p.m., after which the patient takes a meal composed of soup, meat, bread, and potato. Lavage is again performed at 7 o'clock on the following morning, when the amount of undigested food that is evacuated affords an accurate estimate of the degree of muscular insufficiency.

Some writers lay much stress upon the so-called "water test" for myasthenia, which consists of the administration of a pint of cold water and the evacuation of the stomach after the lapse of two hours. When the pylorus is obstructed the fluid is rapidly squeezed by the hypertrophied viscus into the duodenum, although it is unable to dispatch its solid contents with a like celerity; but in myasthenia the feeble, flabby walls of the organ remain practically inert under the stimulus of liquids, and consequently the greater part of the water may be recovered after the lapse of two hours.

The position and size of the stomach and its peristaltic activity are easily determined by X-ray examination.

Chemical Analysis.—The contents of the stomach obtained by a tube or by vomiting usually present a sour, offensive, or rancid odour, and on standing separate into the three layers that are so characteristic of fermentation. An examination of the fermentative activity of the mixture is of some importance in diagnosis, and is conducted in the following manner: A test-tube is completely filled with the chyme or vomit and its mouth securely plugged with an india-rubber cork through which passes a bent glass tube. The apparatus is then inverted in a beaker and placed in an incubator at a temperature of 100° F. The insertion of the cork squeezes some of the material into the glass tube and thus renders the test-tube free from air. When fermentation occurs, bubbles of gas develop and rise to the top of the tube, thereby causing the semi-liquid material to overflow into the beaker. If this process can be observed within two or three hours the degree of retention and fermentation is considerable; but if twelve or more hours elapse the condition is proportionately slight. On analysis the gas is found to consist of a mixture, in varying proportions, of hydrogen, carbonic acid, and nitrogen, with sometimes lesser amounts of marsh gas and sulphuretted hydrogen. The

results of a test-meal vary somewhat in different cases. If secondary gastritis is absent, free hydrochloric acid in diminished amount may be determined, but in long-standing cases chronic inflammation of the stomach almost invariably exists, with the result that free acid is wanting, the combined acid markedly diminished, while traces of organic acids may occasionally be detected. The activity of the special ferments varies directly with the secretion of hydrochloric acid. Microscopical examination of the sediment shows epithelial and food débris, torulæ, numerous bacteria, and, in rare instances, sarcinæ.

Diagnosis.—Myasthenia gastrica seldom presents any serious difficulties of diagnosis if the clinical history and physical signs of the complaint are carefully investigated. The relative severity of the dyspepsia after the ingestion of fluids, and the distention, discomfort, and gaseous eructations which ensue immediately after meals, will always suggest an enfeeblement of the gastric walls rather than an abnormality of secretion, while the persistence of splashing during the period of digestion, the undue distensibility of the stomach, and the retention of food beyond the usual physiological limit are pathognomonic of the complaint. Gastrectasis only ensues in very chronic cases, and in this condition the comparative infrequency of vomiting, the stagnation of fluids, and the absence of other indications of pyloric obstruction serve to distinguish the complaint from the motor insufficiency of pyloric stenosis.

Myasthenia accompanied by *stagnation of food* is apt to be confounded with neurasthenia gastrica, gastroptosis, and chronic gastritis.

In both neurasthenia and myasthenia gastrica the dyspeptic symptoms may be very similar in character, but in the former they vary in severity from day to day even when the same food is taken, are rarely proportionate to the size of the meal, and are most severe after the ingestion of solids,

while in myasthenia, liquids and large meals are productive of the greatest discomfort. In neurasthenia, psychical influences exert a disproportionate effect upon the digestion ; the abdominal plexuses are tender to pressure ; headache, insomnia, general debility, and other signs of general neurasthenia are present, and the motor and secretory functions of the stomach may be normal (Chapter V).

Gastroptosis is easily recognized by its physical signs : The lesser curvature descends in the abdomen and the other viscera are also usually displaced. When, as is frequently the case, the condition is accompanied by myasthenia, splashing sounds and the signs of stagnation of food are also present (Chapter VI).

Chronic gastritis is usually due either to direct irritation of the gastric mucosa or to disease of some other important organ of the body ; its mode of causation therefore is notably different from that of myasthenia. Moreover, except at an advanced stage, the inflamed stomach is not accompanied by motor insufficiency, the organ is not increased in size, and there is no abnormal splashing. The acid secretion is diminished, after a test-meal mucus is present in excess, and a pint of water is easily evacuated into the duodenum within two hours.

Myasthenia with *retention of food* has to be distinguished from *hypersecretion* and *stenosis of the pylorus*.

The symptoms of *hypersecretion* are much more severe than those of simple myasthenia ; pain may be excessive, acid regurgitations are seldom absent, vomiting is very apt to occur at night, while emaciation is often profound though the appetite remains good. The stomach is usually dilated and in most instances a certain degree of pylorospasm exists. The first point which requires elucidation is the nature of the gastric contents in the early morning, and for this purpose the stomach is washed out in the evening and no food allowed during the night. If continuous secretion exists the passage

of a tube in the morning before breakfast will evacuate a considerable quantity of fluid which affords the characteristic reactions of gastric juice. When lavage is not performed overnight, the stomach may be found to contain a certain amount of undigested food mixed with an excess of acid secretion. The history of the case, combined with this demonstration of continuous secretion, is sufficient to determine the diagnosis.

Pyloric stenosis may be due to carcinoma, cicatricial contraction, or to the pressure of a tumour. Obstruction from carcinoma presents, during its early stages, many of the features of primary myasthenia and is therefore very apt to be mistaken for the functional disorder. It may be observed, however, that in the organic complaint the flatulence and discomfort are chiefly experienced after solids, and are at first relieved by a liquid diet ; while the converse exists in cases of primary myasthenia. The loss of flesh and strength is disproportionate to the apparent disturbance of the digestion ; vomiting is frequent and complete, and the progress of the complaint is comparatively rapid. Hypertrophy of the stomach is shown by the presence of visible peristalsis ; a test-meal exhibits few signs of digestion and is largely mixed with mucus, and there is a tendency for free hydrochloric acid to disappear and to be replaced by lactic acid. It may also be shown that there is no undue distensibility of the gastric walls, while the water test proves that fluid is soon passed into the duodenum. X-ray examination affords valuable confirmatory evidence.

Prognosis.—This varies according to the causation and severity of the disease. In the acute variety, the symptoms usually subside under careful treatment within ten days or a fortnight, but since in most instances the myasthenia was latent previous to its sudden manifestation, subsequent attacks are always liable to supervene from apparently trifling causes. Myasthenia with stagnation of food repre-

sents about 86 per cent. of the cases met with in practice, and if properly treated about one-half of these terminate in complete recovery. In the other 50 per cent. the symptoms undergo remissions for periods varying from a few weeks to several months, but the tendency to relapse is never entirely lost, and in many instances a change of climate, an increase of diet, an attack of constipation, a febrile disorder, or a strong emotion will at once occasion a renewal of all the former symptoms. In about 14 per cent. of all cases the complaint gradually drifts into the stage of food retention accompanied by the signs of dilatation of the stomach. The prognosis in this form is, in my opinion, generally unfavourable and I can bring to mind very few cases which can be said to have been cured, and even in these it is probable, owing to the persistence of the physical signs, that the symptoms merely became latent. As long as the retention remains slight in degree and the general nutrition is well maintained it is usually possible by careful treatment to transform the case into the stagnation type of the complaint; but when the patient has already lost much flesh or when secondary gastroenteritis has supervened an amelioration of the symptoms is the only result which can be predicted with confidence.

Gastric myasthenia often precedes phthisis in persons who are predisposed to that disease, and is an almost invariable sequela of arrested pulmonary tuberculosis (Chapter IX).

Treatment.—*Prophylaxis.*—The fact that myasthenia is very apt to develop during convalescence from a febrile malady and in the course of certain debilitating diseases renders it important that special precautions should be taken to conserve the motor power of the stomach. Overfeeding with fluid forms of nourishment, which is so commonly adopted under these conditions, stretches the already enfeebled walls of the viscus and is often the exciting cause of

the malady. For this reason milk should be mixed with barley- or lime-water and be administered in doses not exceeding 6 ozs. at a time, while jellies, meat juices, and meat essences are to be preferred to the home-made beef tea, soups and broths, the nutritive value of which is never proportionate to their bulk. Poached or lightly boiled eggs, ham, bacon, well-cooked fish and chicken which have been passed through a sieve, sheep's brains, calf's head, tripe, and sweetbreads may be given with impunity, and in young persons raw meat pulp mixed with its own juice is easily digested. Bread and other farinaceous substances are apt to create flatulence, and should be omitted in favour of toast, plain biscuits, and the patent digested preparations of Benger, Savory & Moore, Allen & Hanbury, or Nestlé. Uncooked vegetables and fruits are always injurious, and at most a little potato, asparagus, seakale, or cauliflower should be allowed once a day. If constipation is present a baked apple may be given with the first meal. Cocoa made from the nibs or peptonized cocoa is less apt to disturb the gastric secretion than either tea or coffee, and in many cases a tablespoonful of brandy or whisky taken with the food helps to stimulate the appetite and to relieve the tendency to flatulence. Persons who are predisposed by heredity to myasthenia or who have previously suffered from neurasthenia, gastroptosis, or other condition that favours its development should wear a firm binder or belt when they leave their bed, and if necessary should undergo a course of massage and electricity. A dry bracing climate is more suitable than a warm and enervating locality, and the so-called " water cures " invariably do more harm than good.

General Measures.—Massage.—Many sufferers from myasthenia are in the habit of relieving the discomfort they experience after meals by rubbing the upper part of the abdomen, and there is no doubt that much benefit often results from the intelligent and systematic employment of

massage. Unfortunately, every individual who practises massage proclaims that his method of rubbing the abdomen is the true panacea for all disorders of the stomach and intestines, but being quite ignorant of the pathology of inflammatory and ulcerative diseases of the digestive organs as well as the strictly limited value of the massage even in gastric myasthenia, he often manages to produce more injury than benefit. The objects of massage are (1) to promote evacuation of the contents of the stomach and to increase its peristaltic activity; (2) to relieve the associated condition of intestinal myasthenia; (3) to strengthen the abdominal wall.

(*a*) Gastric peristalsis may be excited by gentle stimulation of the cutaneous nerves of the abdomen, in the following manner: The tip of the right thumb of the operator is placed upon the abdominal wall over the centre of the stomach and by rapid rotatory movements of the wrist, the tips of the fingers are allowed to describe a series of circles upon the skin. No pressure is exercised, a light brushing movement being all that is required. At intervals of a minute the thumb is moved to an adjoining spot over the region of the stomach and the process is repeated. This treatment is practised night and morning for ten minutes, at a time when the stomach is empty, and is particularly useful when myasthenia is accompanied by stagnation of food. Patients soon learn to perform it for themselves. Another method of exciting gastric peristalsis is to depress the finger tips of both hands deeply into the abdomen along the left costal margin, and by a series of rapid oscillations of the hands to press the contents of the stomach in the direction of the pylorus.

Zabludowski, Cséri, and others claim that the gastric contents may be squeezed through the pylorus by the adoption of certain mechanical movements, the method of the last-named being briefly as follows: The ulnar border

of the operator's left hand is firmly pressed into the abdomen along the lower border of the stomach, so that the pyloric end of the organ lies in the palm of the hand. The fingers and thumb of the right hand are then pressed deeply into the fundus of the stomach, and by a series of pushing movements the contents are forced toward the pylorus.

(*b*) If the motions are hard and constipation troublesome, massage of the lower bowel should be undertaken first, but if the stools are fluid the rubbing may be begun over the cæcum. In the former case the right hand is laid flat over the upper part of the decending colon, with the fingers of the left hand superimposed upon it, the two hands being slowly moved downward and inward and being made to dip deeply into the pelvis. The right hand is then placed flat upon the cæcum, with the ulnar border pressing more deeply than the radial, the little finger and the thumb are then slightly approximated, and with the fingers in this position the whole hand is moved along the course of the colon; the procedure being repeated three or four times each minute.

To increase the tone of the abdominal muscles massage is applied to the abdominal wall, and the patient performs regular daily exercises with active and resisted movements.

Electricity.—Before the introduction of the triphase alternating current, it was the custom to employ the continuous current to the inner surface of the stomach by means of an intragastric electrode. This method, which is very distasteful to the patient, has been practically superseded by the use of the polyphase alternating current introduced by Reed and Herschell. When applied percutaneously the triphase current produces contractions of the stomach and intestines, strengthens their peristaltic movements, and promotes the evacuation of chyme into the duodenum. The electrodes should each possess the same area and must be well wetted before being applied to the skin. The patient

lies upon a couch with one electrode at the side of the dorsal spine, while the other is placed upon the epigastrium. The current is applied for ten to fifteen minutes each day for a fortnight and then on alternate days for another month. Many of the most obstinate cases of myasthenia lose their symptoms after a course of this character (for full particulars see Herschell's *Manual of Intragastric Technique*, p. 127).

Lavage.—This is only employed in cases of myasthenia accompanied by retention of food and gastrectasis. It is most conveniently performed in the early morning before breakfast, unless the symptoms of dyspepsia are present during the night and interfere with sleep. As a rule, warm boiled water containing bicarbonate of sodium (one grain to the ounce) is all that is required, but if gastric fermentation is active, some antiseptic solution may be used, such as salicylic acid (1 in 1,000); sodium salicylate (1 per cent.); permanganate of potassium (1 in 1,000); boracic acid (1 per cent.), or borax (5 per cent.). Some authorities recommend that after the organ has been thoroughly cleansed with boiled water, a pint of the borosalicylic solution (boracic acid 60 grains, salicylic acid 20 grains to the pint of water) should be poured into the viscus and allowed to remain in contact with its mucous membrane for about five minutes before being withdrawn. A teaspoonful of glycerin administered after the lavage completes the process of antisepsis and also acts as a useful aperient.

Turck, of Chicago, has invented a needle-douche, by means of which the interior of the stomach is subjected to a series of fine streams of fluid ejected under considerable pressure. By the alternate use of hot and cold water any adherent mucus is removed and a tonic effect is produced upon the muscular and secretory structures of the organ. Personally, I have had no experience of this needle-bath nor of the gyromele or internal masseur invented by Turck,

and much doubt whether these appliances can exert any lasting beneficial influence upon the functions of the organ.

The subjects of myasthenia almost invariably suffer from depressed circulation and experience an aggravation of their symptoms if they are exposed to cold. It is therefore essential that they should be warmly dressed at all periods of the year, and during the cold months should wear woollen underclothes. A belt of flannel or chamois leather also affords considerable protection against sudden changes of temperature, and if the stomach is dilated a firm belt applied so as to elevate the lower border of the viscus, as in gastroptosis, will often relieve the sensations of weight and discomfort at the epigastrium.

Attempts have been made to reduce the size of the stomach by infolding the anterior wall of the organ in the line of its long axis, and uniting the peritoneal edges of the infolded portion (Bircher). I have never yet met with a case, however, in which this operation was attended by permanent success, while I have unfortunately been consulted by a very large number of people whose digestive ills have greatly been augmented by attempts to fix the stomach or large bowel in the place it usually occupies, with or without plication. Gastro-jejunostomy is absolutely contra-indicated.

When change of air is considered advisable a dry, bracing place should be selected in preference to a low-lying or enervating locality. For this reason Scotland, Yorkshire, Malvern, and the east and south-east coasts usually agree, while the south and south-west of England almost invariably increase the symptoms of the complaint. If the water is impregnated by chalk, Malvern water, salutaris or some other pure water should alone be drunk. A visit to Switzerland in the summer is often attended by good results, but as a rule high altitudes should be avoided during the winter months. When the myasthenia is accompanied by neuras-

thenia or gastroptosis Egypt or Algiers may be selected as a winter resort with great advantage.

A course of mineral waters is chiefly indicated when constipation and anæmia are prominent features of the case, but should be prescribed with caution when the disorder is accompanied by gastric dilatation. In the former case, Kissingen and Brides-les-Bains in Savoy are indicated, or if a more bracing climate is considered advisable Tarasp in the Lower Engadine may be tried; while in the latter, the iron springs of St. Moritz often afford good results. Carlsbad should be avoided and Marienbad is useless. A moderate course of the waters of Harrogate or Llandrindod is sometimes beneficial.

Diet.—A proper dietary is a matter of the greatest consequence, and the quantity of food as well as the frequency with which it is administered must be carefully adjusted to meet the special requirements of each case. Owing to the fact that liquids are apt to stagnate in the myasthenic stomach, many authorities recommend an entirely dry diet, and only permit a small amount of fluid to be taken before or after meals. As a matter of fact, water is one of the most important exciters of gastric secretion, and when given in moderate quantities along with the food also stimulates the contraction of the gastric walls. Unless hyperchloracidity exists, milk almost invariably disagrees and should never be given in bulk. Both tea and coffee should be prohibited, and peptonized cocoa or that prepared from the nibs or husks alone be allowed. In most instances a little stimulant taken with the food diminishes the sense of oppression and aids the eructation of gas, and for this purpose a tablespoonful of good brandy or whisky mixed with 4 ozs. of hot water may be allowed twice a day at meal-time. On the other hand, malt liquors always disagree and wines can rarely be tolerated for more than a few days owing to their tendency to ferment. In prescribing a dietary it should be

remembered that the processes of digestion are delayed and that stagnation of food in the stomach favours the fermentation of its farinaceous constituents. The frequency with which food should be given must vary according to the special features of each case: during the early stages of the complaint, when food stagnation alone exists, a meal may be allowed every four hours; but when retention is present, five hours should be permitted to intervene between each meal.

An excess of sweets must always be prohibited, and when the stomach is dilated these substances should be eliminated from the dietary. On the other hand, well-cooked rice or corn-flour or one of the patent digested cereal foods may be allowed, while toast or the Brusson-Jeune rolls are to be preferred to wheaten bread or biscuit. Green vegetables and fruits should entirely be avoided in severe cases, but in mild examples of the complaint a little well-cooked asparagus, celery, or spinach, as well as potato may be allowed.

Meat-fat, fat bacon, ham, and salad oil are all injurious to the myasthenic stomach, owing to the fact that they hinder the secretion of gastric juice and delay the expulsion of the gastric contents into the duodenum. It is advisable, however, to administer at least half an ounce of fresh butter each day, and if it can be borne, to permit the use of cream. Lightly boiled or poached eggs form an agreeable addition to the dietary, and can usually be digested without difficulty. The white kinds of fish, such as whiting, sole, cod, turbot, plaice, haddock, and hake, are to be preferred to the heavier and oily varieties, like mackerel, salmon, and herring, and should be steamed or boiled rather than fried, while all forms of dried and smoked fish should be prohibited. Sweetbreads, tripe, sheep's head and brains, calf's head, calf's feet, chicken, pheasant, partridge, and tongue are easily digested, but venison, hare, duck, goose, pigeon, sausages,

pork, veal, curries and meats twice cooked are rarely found to agree. Meat essences, powders and jellies may be given with impunity, but soups and broths almost invariably increase the sense of discomfort and distention. Raw meat pulp often agrees when all other forms give rise to discomfort, and in certain cases the so-called "Salisbury treatment" may be pursued with advantage. Milk curdled by means of lactobacilline is extremely useful in the second stage. A three months' trial of this remedy often completely removes the symptoms. It is chiefly indicated when there is a deficiency of hydrochloric acid, and is apt to disagree when the myasthenia is associated with hyperacidity. Personally, I have never observed any good results attend the use of the various tablets of the lactic acid bacillus.

Medicinal.—The objects of medicinal treatment are (1) to prevent fermentation of the contents of the stomach; (2) to stimulate the muscular structure of the stomach; (3) to augment the digestive powers of the gastric secretion; (4) to promote the evacuation of the bowels.

(1) *Antiseptic treatment* should be adopted in every instance at the outset, and stimulating remedies deferred until the tongue is clean and the symptoms of indigestion have to some extent been relieved. The routine treatment of myasthenia by strychnine, acids, and quinine usually does far more harm than good, since chronic gastritis is not infrequently present and is exaggerated by the exhibition of tonics. Personally, I prefer a mixture of carbonate of bismuth, bicarbonate of sodium, glycerin of carbolic acid, and peppermint water twice a day between the meals. When the tongue is foul half a drachm of the compound tincture of rhubarb or a drachm of the fresh infusion may be added with advantage, or a drachm of glycerin if the stomach is dilated. Others prefer resorcine (grs. 10); bismuth salicylate (grs. 20); salol (grs. 10); dimol; beta-

naphthol (grs. 3); acid salicylic (grs. 10); creasote or guaiacol (m. 3); sodium benzoate (grs. 5); iodoform and charcoal; sodium hyposulphite (grs. 20); sodium sulphocarbolate (grs. 15); or the pil. acid. carbolic.

Excessive flatulence may be combated by peppermint, chloroform, ether and cajuput mixture, or by the essence of Ricqlés.

(2) The drugs which find most favour as stimulants of the musculature of the stomach are strychnine, hydrastin, quinine, ergot, ipecacuanha, and formate of sodium. The first-named is the most reliable and may conveniently be given in combination with quinine and phosphoric acid, while in some instances the tincture of nux vomica with a bitter infusion is equally serviceable. Hydrastin and ergot are very variable in their action, and although occasionally they appear to exert a stimulating influence upon the musculature of the gastrointestinal tract, they are very apt to destroy the appetite and to produce nausea. Many practitioners favour the employment of powdered ipecacuanha in doses of half a grain three or four times a day after meals, but several weeks usually elapse before the case exhibits any decided improvement. Latterly formate of sodium has been strongly recommended by French writers as a muscular tonic, and a distinct improvement sometimes follows its use in cases of myasthenia gastrica. It is most conveniently given in the form of the compound syrup or the tabloids of the polyformiates (Roberts & Co.).

When the myasthenia appears to arise from anæmia, a cautious trial may be made of one of the salts of iron. As a rule, the ammonio-citrate agrees best, and may be combined with the solution of bismuth and bicarbonate of sodium. The initial dose should not exceed 3 grains, but the amount may be increased if the tongue remains clean and no ill-effects ensue from the use of the drug. In other instances the tartrate or ammonio-citrate of iron and quinine

may be employed, or if a milder preparation is indicated, the dialysed solution or reduced iron may be employed. The more astringent salts, such as the sulphate and perchloride, rarely if ever agree. If symptoms of neurasthenia are present, valerianate of zinc combined with dioxide of manganese or the syrup of glycero-phosphates (Robin) are valuable remedies. Zambelleti's hypodermic injections of arsenic and iron (Martindale) are often very useful.

(3) The adjuvants of the gastric secretion are pepsin, pancreatin, papain, diastase, and hydrochloric acid. Theoretically, pepsin ought to relieve the symptoms of indigestion whenever the gastric secretion is deficient in digestive power, and the market is crowded with artificial digestives of this nature. As a matter of fact, however, every stomach, with the exception perhaps of those affected by atrophy or a congenital absence of secretion (achylia) is capable of producing sufficient ferment to deal with every emergency, as long as the production of hydrochloric acid is sustained, and hence the success of pepsin in practice is not commensurate with its reputation in the laboratory. Of the numerous preparations, the pure powder, the glycerin extract, and Liebreich's essence are the most reliable, but even with these it is probable that the benefit that ensues from their use is due more to the hydrochloric acid with which they are usually combined than to the ferment itself. The wines of pepsin have no therapeutic value whatever; indeed, according to the experiments of Hugouenenq the addition of wine to pepsin greatly interferes with its action. Papain has an advantage over pepsin in that it is able to convert proteid into peptone in an alkaline solution. Sittmann, Hirsch, and others have recorded excellent results from its use in cases of gastrectasis accompanied by a deficient digestive power of the gastric secretion, but further experience has not corroborated their statements, and its use is now chiefly confined to cases of atrophic gastritis and nervous achylia.

Pancreatin possesses a similar but more active influence upon proteids than papain, but is of little value in gastric myasthenia unless the complaint is secondary to destructive gastritis.

Diastase is administered with the view of aiding the conversion of starch into sugar. In young children maltine or dia-malt given after meals is sometimes of value, but in adults recourse is usually had to takadiastase or to diastase setterie. Very little is known concerning its real value in myasthenia, but occasionally patients assert that the distention and discomfort after meals are lessened by its employment. Finally, it may be mentioned that compressed tabloids of pentenzyme, which consist of a mixture of all the digestive glands, are occasionally found of use, four to six being administered after each meal.

As compared with the ferments, dilute hydrochloric acid often proves of extreme value in cases of myasthenia where the secretion of the acid is much reduced. As a rule, 15 minims of the dilute solution should be given immediately after meals, but in some instances a tumblerful of a 0·05 per cent. solution taken with the food proves more efficacious. When the myasthenia is accompanied by inflammation of the gastric mucosa the acid should be given with caution, as it is very apt to excite subacute gastritis, and in every instance its administration should be interrupted every ten days for three or four days. The addition of a teaspoonful of glycerin to the acid fluid often appears to increase its efficacy.

(4) No medicinal remedy exerts any permanent influence upon the digestive disorder unless care is taken to procure a daily evacuation of the bowels. In many cases this is ultimately attained by means of the massage, electricity, and exercises already mentioned, but few cases of myasthenia obtain any permanent benefit without recourse being had to aperients. In this connexion it is important to observe

that salines and drastic purgatives usually do more harm than good unless the disorder is complicated by gastritis, and conversely that the mildest aperient is usually the most efficacious. When the constipation is of a mild type or only of occasional occurrence, a large enema twice a week or an injection of glycerin may be all that is necessary, or the patient may be directed to take a tumblerful of hot water with three or four prunes in the early morning. In other instances a combination of the liquid extract of cascara with maltine taken each evening before the last meal procures an easy evacuation on the following morning, or a few grains of cascara, a pinch of Turkish rhubarb, or a cup of Garfield tea at night will be found sufficient. In more severe cases euonymin and rhubarb, aloes and iron, or some other mild pill is required, the dose being gradually reduced as the case improves.

At the present day medicinal paraffin seems to be prescribed for every case of indigestion, if it be associated with constipation. In simple atony of the colon, with a normal stomach, paraffin is a valuable aid to intestinal evacuation; but when the stomach is affected by any disorder of function the liquid vaseline not only remains for a long time in the organ but usually destroys appetite and diminishes the gastric secretion. Its employment is, therefore, rarely successful in myasthenia gastrica.

CHAPTER IV

DYSPEPSIA DUE TO INFLAMMATIONS OF THE STOMACH

(1) Acute Gastritis. (2) Chronic Gastritis. (3) Atrophy of the Stomach

ACUTE GASTRITIS

(Synonym—Acute Gastric Catarrh)

Etiology.—Acute inflammation of the mucous membrane of the stomach is one of the commonest diseases to which the body is liable, but since in the majority of the cases the disorder is extremely slight and temporary in character, it is only the more severe and persistent examples that come under the notice of the physician. In my statistics which deal with hospital practice, 14·2 per cent. of persons complaining of indigestion were found to be suffering from this particular disorder.

Age and Sex.—The complaint is most frequent in children under ten years of age, and is particularly rife among bottle-fed infants who are exposed to the dangers of food infection (Chapter VIII). It is also common among old persons whose digestive organs have been weakened by disease and whose powers of mastication have been impaired or lost by decay of the teeth. Throughout life males are more liable to the disease than females, the ratio of the two sexes being rather more than 3 to 2.

Although it has become the custom of recent years to ignore hereditary influences in the causation of gastric complaints, there can be no doubt that the clinical observations

recorded by writers during the eighteenth and nineteenth centuries were quite correct and that certain families possess a marked predisposition to gastric inflammation. Unlike myasthenia, the tendency to gastritis displays itself at an early period of life, and usually becomes less apparent after the age of thirty.

Persons who are thus affected are commonly said to suffer from "delicate" or "weak digestions," since any departure from a strict diet or carefully considered mode of life is at once followed by the symptoms of acute indigestion. These cases may be divided into two classes—the idiosyncratic and the nervous. In the former, the digestive organs appear to be endowed with certain highly developed idiosyncrasies with regard to particular articles of food, the ingestion of which gives rise to inflammation of the stomach and sometimes also to enteritis. Thus, sweets, fats, cream, eggs, almonds, strawberries, oatmeal, mackerel, shellfish, liver, game, coffee, acid drinks, alcohol, and tobacco are very apt to excite acute gastric inflammation in certain individuals, while in others even small doses of such drugs as digitalis, strychnine, morphine, salicylate of sodium, iodide of potassium, iron, quinine, nitroglycerin, and even bicarbonate of sodium prove equally deleterious. In the second class psychical conditions are chiefly responsible for the disorder, and many children immediately suffer from an attack if they become excited, fatigued, or exhibit an emotional outburst. The predisposition is more often transmitted by the mother than the father.

Acute gastritis is particularly common during the spring and early summer, at which times it not infrequently assumes an epidemic character. As the result of an analysis of 327 cases, Willigk gave the following relative proportions of the number of cases occurring at different seasons: Spring, 6·2; summer, 3·4; autumn, 2·9; winter, 2·5. Epidemics frequently ensue after the breaking up of a prolonged drought

or the subsidence of high winds, and in this connexion it is interesting to note that Todd observed outbreaks of the disorder to follow the *bise* in Switzerland, the *mistral* in Provence, and the *tramontana* in Italy. In England, Brighton has long enjoyed a reputation for "biliousness," and many individuals invariably suffer from vomiting and other symptoms of acute gastritis if they remain in the place for a few hours.

Acute gastritis may ensue either from direct irritation of the stomach or develop as a consequence of some systemic disorder or of disease of another important viscus of the body. From an etiological stand-point two varieties may therefore be recognized, the primary and the secondary.

Primary acute gastritis varies greatly in its intensity in different cases, being comparatively slight and transient in character when the local irritation is unimportant and easily removed, but extremely severe and enduring in its effects when the ingestion of a corrosive has given rise to tissue destruction.

In the majority of cases mild acute inflammation of the stomach is induced by the *ingestion of food*, the quantity, quality, or temperature of which induces irritation of the gastric mucous membrane. It is commonly believed that a mere excess of food is capable of exciting the disorder, and there is no doubt that acute gastritis frequently follows indulgence in an abnormally large meal, especially in young subjects. It is extremely doubtful, however, whether mere overloading of a healthy stomach with substances which are eminently digestible is capable of setting up a catarrhal process. On the other hand, any antecedent or concomitant condition which interferes with the secretory or motor powers of the stomach will promote the fermentation of the contents of the organ when it is the recipient of an unduly large though otherwise digestible meal. The acute gastritis which so often follows indulgence in solid food after

a period of starvation is probably due to the deficiency of gastric juice which results from such abstention (Bidder and Schmidt), and the epidemics of acute dyspepsia, which, according to Barras, used to coincide with the termination of Lent, apparently originated from a similar cause. In like manner, children often suffer from a mild attack of gastritis when they indulge in a full meal after a period of unusual excitement or fatigue, the nervous element in these cases having produced a temporary inhibition of both gastric peristalsis and secretion. In other instances it is the composition rather than the size of the meal that is responsible for its injurious effects. Thus, such substances as starch, fat, or cellulose, which undergo little or no digestion in the stomach, are apt to remain unduly long in the viscus and to excite irritation of its mucous membrane. In young children such mechanical irritation is a factor of considerable importance, but after puberty the disease is almost invariably brought about by chemical rather than mechanical agencies, and its exciting cause is to be found in the action of various products of food-decomposition upon the inner surface of the organ. These chemical irritants may either exist in the food at the time of its ingestion or they may develop as the result of its fermentation in the stomach. In the former case, the meat, broth, fish, or milk has undergone incipient putrefaction outside the body, and the organic poisons thus formed either exert an immediate local action upon the gastric mucosa, or, as is more probable, are absorbed into the general circulation, and subsequently eliminated as irritants by the glandular structures of the gastrointestinal tract. In this connexion it is important to remember that certain articles of diet are more prone to develop poisonous properties than others, and that some individuals are unduly susceptible to their influence. Among fish, mackerel is particularly dangerous, while gurnet, eels, salmon, sardines, anchovies, crabs, and

oysters are also occasionally productive of severe gastro-enteritis. Smoked or partially cured fish may also prove poisonous. All forms of animal food, as well as broths and essences prepared from them, are liable to undergo putrefaction and to develop organic poisons of the most virulent nature, without any offensive taste or smell, and which no ordinary method of cooking will render innocuous. Venison, overhung meat and game, cheese, foie gras, tripe, mushrooms, and truffles are particularly dangerous to certain people.

Sometimes mild acute inflammation of the stomach is excited by the ingestion of food which was unduly hot or too cold. Boiling water provokes a very severe form of gastritis accompanied by superficial ulceration, and the dyspepsia from which cooks so frequently suffer has been attributed to their habit of tasting hot foods. This, however, is extremely doubtful. Indulgence in cold water and iced drinks after severe physical exercise occasionally excites an inflammatory condition of the stomach, but the gastroenteritis that sometimes follows the ingestion of ices is more often due to the poisonous nature of their constituents than to their temperature.

Extremes of heat and cold occasionally give rise to gastritis through their influence upon the skin. Cold winds are especially dangerous in this respect, and many persons habitually suffer from inflammation of the stomach after undue exposure. Conversely, firemen, stokers, glass-blowers, and workers in furnaces are liable to a severe form of gastritis, accompanied sometimes by violent spasm of the colon and dangerous collapse, if they suddenly emerge into a cold atmosphere or drink cold water. The violent inflammation of the stomach which ensues from swallowing strong acids or alkalies is too well known to require more than a passing notice, but it should always be borne in mind that many drugs administered in medicinal doses may be the unsuspected cause of troublesome gastric inflammation.

Thus, mustard, antimony and ipecacuanha owe their emetic effect to direct irritation of the stomach which may proceed to inflammation, while apomorphine when injected beneath the skin is partially excreted by the gastric mucosa with the production of catarrhal changes in the peptic glands. A marked degree of intolerance is also displayed by many persons toward minute doses of such drugs as iron, arsenic, phosphorus, quinine, nux vomica, creasote, copaiba, sandalwood oil, antifebrin, antipyrin, salicylates, iodides, bromides, aspirin, bitter infusions, and mineral acids, while even wall papers containing arsenic (King Chambers) and lead lotions have been known to cause gastritis.

In this connexion the subject of preservatives in food deserves special attention. In a Report of the Departmental Committee issued in 1901 it was stated that 45 per cent. of the samples of preserved foods submitted for analysis by various local authorities were found to contain preservatives, the principal of which were boric acid, salicylic acid, sulphites, sulphur dioxide, benzoic acid, sulphate of copper, and formalin. The proportions of these added preservatives were of wide range. In the case of sausages, potted meats, and brawn, boric acid varied from 15–66 grains per pound; and in bacon from 8·6–46. Salicylic acid was found in jams in amounts varying from 1·7–8·5 grains per pound; and in temperance drinks from 1·5–19 grains per pint. Sulphites in lime juice, ginger wine, etc., ranged from 0·1–4·5 grains per pint. It is probable that the frequency with which preservatives are employed and their relative amounts are much greater to-day than was the case at the commencement of the century. While it is impossible to estimate the exact influence of these chemical substances upon *healthy* digestive organs, three important facts must always be kept in mind: (1) Certain individuals, as already mentioned, exhibit a natural intolerance of drugs,

the administration of which produces gastritis or gastro-enteritis; (2) some drugs are cumulative in their action, with the result that while their occasional ingestion may prove innocuous their repeated use excites local and general manifestations of poisoning; (3) old people and children are affected by comparatively small doses, which also in sick persons and those suffering from diseases of the alimentary tract are apt to induce serious inflammation of the stomach and intestines, sulphate of copper and formalin being particularly injurious.

The onset of diarrhœa or other symptoms of disordered digestion is often attributed by people to indulgence in canned or bottled meats, vegetables, or fruit, and in severe cases the term "ptomaine poisoning" is usually applied to their complaint; although in many instances the gastro-intestinal phenomena are more suggestive of irritant poisoning than of organic toxins. The fact that other people partook of the same meal with impunity, while usually held to acquit the food of deleterious properties, in reality supports the theory of poisoning by some "preservative," since a natural intolerance of chemical substances employed to preserve foods is infinitely more common than an abnormal susceptibility to ptomaines and other organic poisons. The greatest difficulty, however, is to distinguish between the indigestibility of the food-stuff itself and the effects of its preservative. For example, the subjects of atonic dyspepsia, hypersecretion or gastritis usually suffer from acute indigestion if they indulge in green vegetables or fruits even in a fresh state, and consequently the development of pain, sickness or diarrhœa after eating these materials in a preserved condition is usually regarded as a direct result of a dietetic transgression, and no suspicion of "preservative poisoning" is entertained. But drug intolerance is always as noticeable a feature in these diseases as the inability to digest green vegetables and fruit; indeed,

it may be said greatly to exceed it in most instances, and while the effects of an indigestible meal disappear after a few hours, the subacute gastritis excited by a comparatively small dose of copper sulphate or other drug may endure for several days. I am quite certain that the frequent use of preserved foods by those who suffer from disordered digestion greatly increases their dyspeptic symptoms and often nullifies all attempts to cure them. This statement applies particularly to people who live alone and are indisposed to cook for themselves, as well as to travellers and picnic parties who also rely to a great extent upon preserved foods. Personally, I never permit the use of canned or bottled foods, preserved milk or cream, lime juice or any temperance drinks by patients who suffer from any form of indigestion.

Occasionally the disease presents epidemic features. In most instances of this kind acute gastritis appears coincidently with outbreaks of diseases which exert a specific action upon the digestive tract, such as cholera (Barras, Fox, Chomel), dysentery (Sydenham), and typhoid (Broussais), but it also accompanies certain epidemics of influenza. Chantemesse has drawn attention to the occurrence of epidemic gastritis whenever the water of the Seine was distributed to Paris, and Gaffky has reported three cases which were traced to the use of milk obtained from a cow that was suffering from hæmorrhagic enteritis. The latter observer has also shown that many cases of meat and sausage poisoning are due to the presence of pathogenic micro-organisms. It would, therefore, appear that not only are there certain definite forms of acute gastritis which may be termed infectious in contradistinction to toxic, but that the micro-organism, which in one individual will produce a specific disorder like cholera, typhoid, or dysentery, will in another merely initiate a more or less severe inflammation of the gastrointestinal tract. In one case which came under

the writer's notice, three people became infected by an intensely virulent species of the B. coli communis, one of whom almost lost her life from acute ulcerative colitis, while the other two suffered from moderate gastritis and gastro-enteritis respectively.

Certain individuals, and especially those who suffer from chronic post nasal catarrh, are extremely liable to attacks of febrile "colds," which are described as "passing through the body" or, in other words, of being followed by vomiting and diarrhœa. As a rule the m. catarrhalis appears to be the exciting agent of the disorder, but occasionally B. Friedlander or pneumococci predominate in the secretions. It is interesting to note that these patients often react very favourably to a mixed coryza vaccine, which creates immunity not only from the nasal catarrh, but also from that of the stomach and intestine.

Finally, it may be observed that psychical impulses and nervous disturbances are often held responsible for an attack of gastritis or "biliousness," excitement, anger, anxiety or shock being followed immediately by the symptoms of the complaint. It is probable that emotions of this nature inhibit the secretion of the stomach and also produce a temporary paresis of its muscular structure, with the result that the food present in the organ undergoes rapid fermentation and thus excites local irritation of the gastric mucosa.

Secondary Acute Gastritis.—This is a common complication of diseases both of the stomach itself and of other important organs of the body. All varieties of chronic inflammation of the stomach are apt to exhibit from time to time an acute phase of the complaint, while cases of simple ulcer, cancer, sarcoma, gastrectasis, hypersecretion, myasthenia and gastroptosis almost invariably display the symptoms of acute gastritis at some period of their course.

Diseases which cause obstruction of the portal circulation produce venous congestion of the stomach and thus predis-

pose to the development of gastritis; consequently, valvular affections of the heart, emphysema, chronic phthisis, interstitial pneumonia, bronchiectasis, cirrhosis of the liver, perihepatitis, pressure on the portal vein, and enlargements of the spleen are all liable to be attended by inflammatory disorders of the stomach. Acute inflammation of the kidney is always accompanied by an acute parenchymatous gastritis (Fox, Fenwick), which is also a pronounced feature of many specific febrile diseases at their commencement, especially scarlatina (Fenwick), measles (Barthez and Rilliet), cholera (Andral), typhoid, diphtheria, variola, erysipelas (Bamberger, Frank), pneumonia, puerperal fever, (Fox), tuberculosis (Fenwick, Marfan), and influenza. Pyæmia is invariably accompanied by inflammation of the gastrointestinal tract, and cases have been recorded in which phlebitis was ushered in by symptoms of the disorder. There is also good reason to believe that inflammation of the stomach plays an important part in the causation of the pernicious vomiting of pregnancy. Severe burns and scalds of the skin are apt to be followed by intense inflammation of the alimentary canal, especially of the stomach and duodenum, which sometimes proceeds to ulceration (Erichsen), and in certain cases of acute general eczema the cutaneous affection alternates with attacks of severe gastritis (Samuel Fenwick).

Primary mycoses of the stomach are always associated with acute inflammation of the organ, and cases have been recorded in which favus (Kundrat), thrush (Rosenheim), anthrax (Birch-Hirschfeld, Martin), and diphtheria (Smirnow, Fenwick) attacked a considerable area of the inner surface of the viscus. Finally, gastritis of an acute as well as a chronic type ensues from the irritation of foreign bodies, larvæ, ascarides, tæniæ, and other living creatures.

Pathology.—Our knowledge of the pathological changes in the stomach which ensue from acute inflammation is

extremely limited, partly because uncomplicated cases of the disease rarely terminate fatally and partly by reason of the autodigestion of the tissues which occurs immediately after death and has the effect of destroying the greater portion of the mucous membrane. The earliest and most reliable observations upon the subject were made by Beaumont, who was able to observe the state of the stomach through a fistulous opening, and although many modern pathologists (Fleiner, Fleischer) appear to regard his statements as untenable in the light of modern knowledge, there cannot be the slightest doubt that Beaumont's observations were correct. Thus, we are told that when the patient had overeaten himself, the inner surface of the stomach appeared to be swollen and hyperæmic, and was covered with a thick layer of tenacious mucus. The secretion was also greatly diminished, and was mostly neutral or alkaline in reaction, while food introduced into the organ underwent little or no solution and remained stagnant from four to six hours. A still more vivid picture of inflammation is afforded by the appearance of the stomach after the patient had taken an excess of ardent spirits for several days, when the mucous membrane presented eruptions of deep red pimples and pustules, interspersed with crimson patches half an inch to an inch and a half in circumference, aphthous crusts, and abrasions, with grumous blood exuding from several separate points. It was also noted that the gastric fluids were mixed with thick ropy mucus and muco-purulent matter slightly tinged with blood, possessed a fetid and disagreeable odour, and resembled the discharge from the bowels in some cases of chronic dysentery.

Most of the microscopical observations have been made upon animals in which acute gastritis had been induced by various methods. In such preparations, as well as in isolated cases occurring in the human subject, the earliest sign of inflammation is a granular, cloudy swelling of the

superficial epithelium which proceeds at a later stage to mucoid degeneration of the cylindrical cells and their detachment from the basement membrane. In the pyloric region these appearances involve the glands throughout their entire length, but in the cardiac two-thirds of the organ the parietal and peptic cells are indistinguishable from one another, and become cloudy, granular, contracted, or filled with globules of fat. The capillaries in the superficial layers of the mucosa and between the glands are much dilated and choked with corpuscles; small hæmorrhages are present here and there, and an accumulation of small, round cells may be observed in the connective tissue, mixed with leucocytes and red corpuscles. Karyokinetic figures are sometimes observed in the emigrated leucocytes and superficial epithelium, which, according to Sachs, are characteristic of acute gastritis. In severe examples of the disease capillary congestion and exudation are also present in the deeper layers of the mucosa and in the submucosa, accompanied by hyperæmia and swelling of the solitary glands.

Clinical Varities and their Symptoms.—Acute inflammation of the stomach arises from so many causes and presents such various grades of severity that an accurate classification of its protean features is almost impossible. It is true that in recent text-books upon diseases of the stomach much ingenuity are shown in a minute analysis of symptoms and the differentiation of many varieties and subvarieties of the complaint; but a careful consideration proves that the principal points of distinction between these so-called clinical forms are either etiological or pathological, while the symptoms themselves differ only in their severity or duration. When it is borne in mind that no constant relationship exists between the degree of gastric inflammation and the severity of its resultant symptoms, and that the same cause will in one person excite a dangerous form of gastritis while in another its effects are comparatively mild

and evanescent, it is obvious that a clinical description must be based entirely upon clinical considerations and should be made as simple as possible.

Acute gastritis may conveniently be divided into two great classes, the *simple* and the *toxic*. In the former the disease tends to undergo spontaneous resolution like other simple inflammations, and its constitutional symptoms are subordinate to those which ensue from the inflamed viscus; while in the latter actual destruction of tissue often results, and secondary phenomena of a diverse and dangerous nature may take precedence of and even mask the distinctive indications of the gastritis. The fact that certain cases of simple gastritis are accompanied by a degree of fever which renders their diagnosis a matter of difficulty must constitute an excuse for the subdivision of that variety into a *non-febrile* and a *febrile* class.

Simple Acute Gastritis (Acute Gastric Catarrh)

(1) *The Non-febrile Variety.*—This is most frequently encountered in families which are predisposed to the complaint, and is apt to be excited by an unduly large meal after prolonged abstention or severe physical exercise, by a strong emotion, or by indulgence in some form of material or drug against which an idiosyncrasy exists on the part of the patient. As a rule it develops suddenly and without premonitory phenomena, but in young children an attack is sometimes preceded by increased appetite and a wonderful buoyancy of spirits.

The first symptoms are usually a sense of fatigue, general malaise, and aching in the back, limbs, and head, followed in a short time by epigastric discomfort and distention. To these a dull frontal headache is soon added, and not infrequently severe cramp-like pains in the abdomen, attended by giddiness, faintness, palpitation, and even a fear of impending death are also observed. When the

headache is exceptionally violent, there may be intolerance of light and sound and profuse sweating, while in children slight strabismus, restlessness, an inspiratory form of dyspnœa, and hiccough, with a slow, weak pulse, are occasionally early symptoms. As a rule an increased flow of saliva ushers in a feeling of intense nausea which culminates in the rejection by the stomach of the last meal. Less frequently the gastric contents pass into the intestine where they excite griping pains followed perhaps by several loose actions of the bowels. Although the initial emesis gives considerable relief, and in some instances cuts short the further progress of the disorder, nausea usually recurs at intervals and is attended by severe and repeated attacks of retching. As soon as the remnants of the last meal have been expelled, the vomit consists entirely of a viscid, bile-stained mucus, the rejection of which is often accompanied by such severe straining that fibres of the abdominal muscles become torn with the production of acute pain in the epigastrium. Occasionally the structure of the diaphragm suffers a similar lesion, and a week or more may elapse before respiration ceases to be accompanied by pain, while in other instances a severe stabbing pain in the perinæum suggests slight laceration of the levator ani.

As the result of the violent retching the skin of the face and neck becomes suffused and punctiform hæmorrhages may appear on the forehead, cheeks, and beneath the conjunctivæ, while straining of the pharyngeal muscles in the effort to expel the mucus from the stomach not infrequently causes the ejecta to become tinged with blood. In elderly persons affected with high blood pressure, congestion of the brain from the same cause may give rise to semi-unconsciousness or even to apoplexy. An attack of retching is often excited by a movement of the body, an attempt to swallow food or even by speaking; but in cases where the patient habitually vomits with difficulty, retching is apt

to prove particularly distressing and to result in little or no relief. The subjects of gastroptosis suffer disproportionately in this respect, and in certain cases of simple gastritis vomiting is impeded or entirely prevented by a spasmodic contraction of the œsophagus or cardiac orifice (Skoda).

As a rule, after manifesting itself at short intervals for twelve hours or longer, the retching and vomiting gradually become less frequent and finally subside along with the salivation and nausea.

The character of the vomit varies at different times. At first it consists of undigested food, the particles of which are coated with a tenacious mucus and possess a sour and disagreeable smell. Although acid in reaction, free hydrochloric acid is almost invariably absent, and the total acidity of the fluid after filtration is found to be much reduced. Occasionally the ejecta are neutral or even alkaline. If the last meal contained much fat or farinaceous material, products of fermentation in the form of lactic and butyric acid, with perhaps traces of fatty acids, may often be detected. The presence of acetic acid usually indicates the use of alcohol. Senator has drawn attention to the occasional existence of sulphuretted hydrogen in the stomach and urine as a result of excessive decomposition of albuminoids, but this abnormal product is extremely rare. At a later stage the vomit consists entirely of thick, opalescent mucus, mixed with yellow or green bile and occasionally with traces of blood. As the result of excessive straining, round worms and other intestinal parasites are sometimes forced through the pylorus and vomited.

For several days after the subsidence of the complaint, an analysis of the gastric contents will show that the stomach only recovers its digestive powers in a very gradual manner, since the particles of bread consumed at the test-breakfast are mixed with mucus and show signs of tardy digestion,

while the total acidity remains abnormally low and free hydrochloric acid is absent.

During the crisis of the attack the patient exhibits extreme listlessness and appears weak and ill. The face and lips are pale, the eyes sunken and surrounded by black or bluish lines, and the forehead is often covered with a cold sweat. The lips are dry and cracked, and an eruption of herpes sometimes appears upon the face or ear. The tongue is moist, swollen, covered with a thick, creamy fur and indented along the margins by the teeth, while its posterior third is usually stained by any medicine or food which has been taken. The breath is offensive, the saliva abundant and abnormally viscid, and complaint is made of an acid, bitter, or insipid taste in the mouth. The circulatory system is depressed, and the pulse is small, slow, and compressible. The urine is scanty, high-coloured, and deposits urates after standing; occasionally it possesses the sweet odour of acetone like that voided in diabetes, when the addition of a few drops of the solution of perchloride of iron produces a blood-red coloration; or a small quantity of indican may be detected in it. The appetite remains in abeyance during the whole course of the disorder and the utmost loathing may be expressed toward food of any kind, while its forcible administration is at once followed by retching or vomiting. On the other hand, as soon as the acute symptoms have subsided there is often a craving for acid, salt, or piquant foods, and lemons will be devoured with avidity, as though the patient was unconsciously endeavouring to supplement the deficient acidity of his gastric secretion. Thirst is always present and may be insatiable. In children, and also in those who suffer from engorgement of the portal system, the breath often smells of acetone, and the sweet odour usually persists until the normal appetite returns. The lassitude, depression, and headache are sometimes attributed to this mild acetonæmia but, according to my

experience, no constant relation exists between the degree of acidosis and the severity of the symptoms.

The bowels are usually confined, and the evacuations are hard, knotty, drab-coloured, and extremely offensive. Occasionally, and especially in young subjects, they are loose and frothy, or green from the presence of altered bile.

In severe cases symptoms due to disturbance of the central nervous system are rarely absent, and complaint is made of faintness, giddiness, palpitation, and dyspnœa, while in some instances loss of memory or a confusion of ideas supervenes. These secondary phenomena are particularly common in females and young children, in whom a semi-comatose condition or even epileptiform convulsions occasionally occur. The degree of headache also varies considerably in different cases, and is sometimes so intense as to suggest inflammation of the meninges. In other instances where vomiting and headache recur at intervals, the attacks may closely resemble those of migraine, to which in reality they are closely allied.

The inflammatory affection of the stomach is occasionally complicated by urticaria, which either implicates the whole surface of the body or is localized to the face and scalp. In the latter case there is usually much œdema, but little or no itching. The cutaneous affection is particularly apt to develop when the gastritis has arisen from indulgence in mackerel, shell-fish, almonds, mushrooms, or pork, or from the administration of cubebs, quinine, salicylate of sodium, and certain other drugs.

(2) *The Febrile Form.*—In infancy and childhood an attack of simple acute gastritis is usually accompanied by slight elevation of the temperature, and in certain cases a moderate degree of fever persists during the whole course of the malady. In this category are included the various examples of "gastric fever" and "infectious gastritis" which occur during epidemics of cholera, dysentery, typhoid, ulcerative colitis or influenza, or ensue from bacterial contamination of water,

milk or meat. Delicate children, and those who are predisposed by heredity to the complaint, will also develop mild febrile gastritis if exposed to cold, damp, or fog.

The onset of an attack is usually indicated by pains in the back and limbs, headache and chilliness, or slight rigors, which often persist for several days, and may be accompanied by an eruption of herpes labialis; but in young children extreme restlessness, stupor, rigidity of the neck or even convulsions are sometimes the first indications of illness. The temperature rises abruptly and may reach 103° or 104° F. within a few hours; but in adults the mercury seldom rises above 100° F. On the second day the fever becomes markedly remittent and gradually subsides until it finally disappears at the end of seven to ten days. Occasionally the disorder terminates by crisis on the third or fourth day. Pain in the abdomen is rarely a prominent feature of the case, but a sense of fullness, heat, or oppression at the epigastrium is always present. Vomiting is less frequent than in the afebrile variety, and only occurs at intervals; nausea, on the other hand, may be extremely troublesome and persistent. The ejecta contain an excess of mucus and are devoid of free hydrochloric acid. The pulse is small and quick, the tongue is covered with a thick white fur, and the odour of the breath is at first offensive and subsequently sweet from the presence of acetone. As a rule the bowels are confined, and the stools are pale and fœtid.

The fact that the complaint is so often due to an infection of the digestive tract serves to explain the frequent implication of the duodenum and colon. When the former portion of the bowel becomes affected, the skin acquires a sallow colour and the conjunctivæ exhibit an icteric tinge. Drowsiness, headache, and extreme lassitude are prominent symptoms, and the stools become devoid of colour. In the epidemic form of the complaint jaundice

is a common phenomenon and may persist for several weeks. Inflammation of the colon is characterized by the passage of loose offensive stools containing shreds or strings of mucus and occasionally streaks of blood. Complaint is also made of griping pains in the abdomen accompanied by distention, flatus, and increased frequency of micturition. If the appendix has previously been diseased an acute attack of appendicitis may develop from extension of the cæcal inflammation. Slight albuminuria is not uncommon during the febrile period of the gastric complaint, and occasionally acute nephritis supervenes after the lapse of a few days. This latter complication is chiefly encountered in cases of food poisoning and is particularly prone to occur in the subjects of syphilis. In all cases, and especially in young children, loss of weight is a noteworthy feature of an attack, and often seems quite disproportionate to the degree of local and general disturbance engendered by the gastric disorder. As soon, however, as the stomach resumes its functional activity, flesh and strength are regained almost as rapidly as they had previously been lost. When the submaxillary or cervical glands have been enlarged prior to the gastritis these lymphatic structures often increase in size during the febrile period.

Diagnosis.—The diagnosis of simple acute gastritis *without fever* does not usually present much difficulty. Children are more prone to disorders of digestion than to any other complaint of an afebrile character and consequently when indigestion develops suddenly during a period of perfect health and is accompanied by nausea, retching, and vomiting of bile-stained mucus, the probability of acute inflammation of the stomach must at once be apparent. This is converted into a certainty if it be found that the first ejecta consist of undigested remnants of a meal consumed many hours previously, mixed with a large quantity of a mucoid

fluid which contains organic acids but is devoid of free hydrochloric acid. In many instances also there is either a history of previous attacks of a similar nature or the present disorder can be traced to some hygienic or dietetic error. When headache, palpitation, dyspnœa, or giddiness are prominent features of the case, a fear of meningitis is sometimes entertained. Careful consideration, however, will usually show that these several phenomena are merely secondary to the inflammatory disorder of the stomach, while the essential indications of cerebral mischief are absent. Migraine and acute gastritis are so closely allied that in some instances it may be difficult at first to differentiate one from the other. As a rule, however, the former complaint is much more common after the age of puberty than in childhood, while inquiry will show that one of the parents or other members of the family have suffered in a similar manner. Violent headache, accompanied perhaps by various sensory phenomena, constitutes the earliest symptom of migraine and tends to subside after the emesis has commenced, while in simple gastritis epigastric discomfort, nausea, and vomiting are the primary manifestations and the headache is of secondary importance. A disorder very similar in its general features to migraine is also met with in the subjects of gastroptosis, but in this instance the discovery of a displaced stomach will at once indicate the nature of the complaint.

Acute hypersecretion is the most important disease from which acute gastritis has to be distinguished. In both complaints nausea, retching, and vomiting are prominent symptoms, and the inability to take nourishment by the mouth causes rapid loss of flesh and strength. It will be remembered, however, that acute hypersecretion is merely an acute phase of a chronic disorder of the stomach arising from an organic lesion of the digestive tract, and that the vomit, instead of being scanty, alkaline, and

composed of mucus, as in simple gastritis, is abundant, liquid, acid, and contains an excess of free hydrochloric acid; in fact, it is only necessary to dip a piece of congo-red paper into the ejecta to distinguish between the two disorders. The extreme severity of the epigastric pain and the frequent existence of free hydrochloric acid in the vomit will usually serve to differentiate the gastric crises of locomotor ataxia from simple inflammation of the stomach.

It must never be forgotten that all forms of chronic gastritis are liable to exhibit intercurrent attacks of an acute character, the occurrence of which are apt to divert attention from the renal, pulmonary, splenic, or hepatic complaint to which they owe their origin (Chapter IX).

The fact that gastritis accompanies the onset of scarlatina, variola, and other specific fevers may render the diagnosis of simple *febrile* gastritis a matter of some difficulty. After the expiration of twenty-four hours, however, the absence of characteristic symptoms of the infectious disease coupled with the remittent type of the fever is usually sufficient to indicate the purely local nature of the disorder. On the other hand, there is little doubt that mild cases of typhoid in children are frequently regarded as "gastric fever" owing to the absence of spots and the irregular form of temperature. Care should always be taken, therefore, to eliminate the possibility of enteric fever by an examination of the blood for the Widal reaction.

Prognosis.—The duration of an attack of afebrile gastritis is somewhat uncertain. When the case is seen at an early period of the complaint and treated in an appropriate manner, it usually terminates in three to five days; but if neglected it may be prolonged in a subacute form for several weeks. It is only when the patient is debilitated by some serious organic disease that the gastric affection can be regarded as dangerous to life.

The febrile variety pursues a somewhat longer course

and the fever may not completely subside for ten or twelve days, while if complicated by jaundice or inflammation of the colon convalescence may be postponed for several weeks.

Treatment of Simple Acute Gastritis.—*General.*—The prevention of acute gastritis in persons who are predisposed to the disorder is a matter of primary importance. In the case of young children an attack is usually precipitated by exposure to cold or fog or by the ingestion of substances which are either in a state of incipient putrefaction or are unsuitable to the peculiar digestive powers of the individual. However pure the milk may appear to be, it is always advisable to sterilize it at home, and water should invariably be boiled; while if the latter contains an excess of calcium salts, Salutaris, Malvern water, or that obtained from some natural spring should be substituted for the local supply. One of the reasons why so many persons suffer from acute gastritis or "bilious attacks" when they reside at certain places on the east and south-east coast of England is that the drinking water is exceptionally "hard" or "chalky." Attention has already been drawn to the fact that the epidemic forms of gastroenteritis are almost invariably due to the presence of pathogenic organisms in the milk or water.

Excessive indulgence in food and overloading the stomach with sweets, fruit, and cake are apt to lead to gastrectasis in persons who have already suffered from several attacks of inflammation of the stomach and thus to predispose to frequent recurrences of the complaint. It is, therefore, advisable that in such cases the meals should be given at regular intervals and be composed of substances which are least liable to undergo fermentation in the stomach. Care must always be taken to protect the surface of the body from rapid changes of temperature, and with this view woollen underclothing of suitable thickness and warm

stockings must be worn all the year round, with a flannel or chamois-leather belt next to the skin. Cold baths should be avoided even in summer. The fact that unusual excitability and buoyancy of spirits often precede an attack of gastritis in children constitutes an indication for the administration of preventive treatment in the form of a dose of calomel and a saline purge; while in those cases where undue excitement or fatigue usually provokes the disorder, the amount of outdoor exercise must be restricted and children's parties or other forms of entertainment be prohibited for a few years.

Diet.—An inflamed organ requires physiological rest, and an inflamed stomach is the best illustration of this elementary law. Starvation is essential to the rapid cure of acute gastritis, and no food should be administered by the mouth for twenty-four hours or even longer. In the case of an adult this abstinence produces no ill-effects, but in young and debilitated children deprivation of nourishment is apt to increase the exhaustion produced by retching and vomiting, and it may, therefore, sometimes be necessary to administer nutrient enemata composed of peptonized milk and a few drops of brandy. When thirst is excessive small pieces of ice may be sucked at intervals or the patient may be encouraged to drink large quantities of hot water with the view of inducing vomiting and thus cleansing the stomach of its mucous contents. It is usually held that cessation of sickness and the return of appetite are the chief indications for the administration of food; but it must be borne in mind that profound exhaustion is itself productive of anorexia as well as nausea, and that the latter symptom will often disappear when the patient forces himself to take food. As a rule, feeding may be commenced with impunity within forty-eight hours of the commencement of an attack, but should the stomach reject the nourishment recourse must be had to rectal alimentation. In such cases

from 8 to 15 ozs. of peptonized milk are slowly introduced into the bowel by means of an india-rubber catheter and funnel, about forty-five minutes being required for the performance of the operation. A rectal douche of normal saline solution night and morning prevents irritation of the bowel and promotes the retention and absorption of the milk. When the stomach is able to retain food, iced milk, diluted with an equal quantity of lime-water, may be given in tablespoonful doses every hour for six hours, after which time, if vomiting has not recurred, the dose may be increased to 6 ozs. or more and the proportion of lime-water gradually diminished. In severe cases egg-albumin mixed with water, followed by iced whey should be substituted for the milk or koumiss may be tried. As soon as the nourishment is retained with comfort, the diet may be increased by the addition of clear soups, bovril, beef tea, Benger's food, toast and milk, and lightly boiled or poached eggs; and subsequently by fish, chicken, sweetbread, scraped meat, lean ham, etc. Cooked meats and green vegetables should be prohibited for at least a week, and the meals should remain moderate in amount and be taken at regular intervals.

Medicinal.—Acute simple gastritis undergoes spontaneous cure by the operation of two great natural factors, namely, the evacuation of the irritant contents of the stomach by vomiting, and the period of physiological rest which is imposed upon the organ owing to the suppression of appetite. The medicinal treatment of the disease should therefore be conducted upon these lines. In every case the first consideration should be what amount of noxious material is still contained in the stomach, as shown by the vomit. Should emesis not yet have commenced, or if the ejecta exhibit traces of food, the obvious indication is to assist the stomach to rid itself of its irritant contents. With this object 20 grains of powdered ipecacuanha may be adminis-

tered at once and followed in a few minutes by a tumblerful of hot water, while in the case of a child 10 to 15 minims of the liquid extract or a dessertspoonful or more of the wine of ipecacuanha may be employed. A dose of emetine or a hypodermic injection of apomorphine finds favour with many practitioners, but they are apt to prove unduly depressant to some individuals. Substances like mustard, tartar emetic, sulphate of zinc and sulphate of copper, which cause vomiting by direct irritation of the mucous membrane of the stomach, should be avoided as they tend to increase the existing inflammation. Even after all the decomposing food has been evacuated, the inner surface of the viscus may still continue to be irritated by the presence of fermenting mucus, the expulsion of which is a matter of great difficulty owing to its thick and tenacious character. Continental writers consequently advise that the stomach be washed out with warm water containing a small quantity of bicarbonate of sodium whenever the emesis recurs at short intervals and the ejecta consist of mucus. Lavage is a most excellent remedy and will usually subdue the nausea and retching more quickly than any other form of treatment; but unfortunately many people object most strenuously to the passage of the tube and will only submit to its use when milder measures have failed to effect a cure.

The stomach may also be cleansed by the propulsion of its contents into the intestine, and since the time of Hippocrates brisk purgation has always been regarded as indispensable to the cure of acute gastritis. In infants and young children a dose of castor oil or the administration of a castor oil mixture every three hours will usually promote a rapid cure in mild cases; but if vomiting is a troublesome feature, one-third of a grain of calomel given every two hours until free purgation has been produced will be found more efficacious. At a later period of life the same method of treatment is equally successful, although preference

should be given to salines rather than to castor oil. As soon as the vomit is free from food, about two grains of calomel or a mercurial pill may be administered, followed after three hours by a Seidlitz powder or a full dose of Carlsbad salts, sulphate of sodium or magnesium, or of phosphate of sodium. A tablespoonful of a mixture composed of equal parts of the phosphate and dried sulphate of sodium dissolved in a tumblerful of hot water is usually an excellent remedy and may be repeated on the following morning.

It rarely happens that the vomiting continues after the bowels have been thoroughly evacuated; but should nausea or retching still prove persistent, a mixture of solution of bismuth and dilute hydrocyanic acid, with or without morphine, administered in an effervescent form, will usually cause these symptoms to subside. A hypodermic injection of morphine is seldom required. In the after-treatment of the case it may be necessary to repeat the mercurial and salines at intervals or to prescribe a mixture containing bicarbonate of sodium and rhubarb to be taken between meals. Tonics invariably disagree with the subjects of gastritis, and in many cases the exhibition of these drugs either causes a recrudescence of the acute symptoms or induces a subacute form of the disease. Alkaline remedies, on the other hand, always agree, and if the case shows a tendency to relapse they may be continued with advantage for several weeks.

When abdominal pain is a prominent feature of the complaint, hot moist applications to the abdomen in the form of poultices or fomentations are of value, to which turpentine, mustard, or laudanum may be added if considered desirable. Leeching and cupping, which formed part of the routine treatment of simple gastritis in former days, are seldom, if ever, employed at the present day.

Acute Toxic Gastritis

Although in a general sense all forms of acute gastritis are toxic in origin, it is advisable from the clinical stand-point to confine the term " toxic " to that variety of severe acute gastritis which is caused by the introduction of certain poisonous substances. The unpleasant frequency with which murder is committed by the administration of crude poisons and remains unsuspected until a more or less fortuitous investigation has been instituted, emphasizes the fact how few medical practitioners really comprehend that gastritis is always the result of some variety of poison, and that the mere recognition of its symptoms is useless *unless the exciting cause of the disease is accurately established.* The readiness to attribute death to " gastritis " without this important clinical investigation is almost an inducement to a criminal mind to remove inconvenient relatives, and I have seen more than one case in which I was convinced murder was being attempted by irritant poisoning under the very eyes of the doctor in attendance. In my opinion no certificate attributing death to " gastritis " or " enteritis " should ever be accepted without independent investigation.

The substances which most often cause toxic gastritis are the concentrated mineral acids and caustic alkalies, carbolic, oxalic, and chromic acids, corrosive sublimate, alcohol, arsenic, antimony, phosphorus, and the oxalate and cyanide of potassium. In a lesser degree all medicinal remedies given in excessive doses produce a toxic inflammation of the stomach, especially when the patient happens to possess a natural intolerance of them, while certain organic substances formed by the decomposition of meat and other nitrogenous foods are capable of inducing violent gastroenteritis when introduced into the body. Chlorine gas, in the late war, was productive of many cases of gastroenteritis.

Pathology.—Concentrated mineral acids and carbolic acid dehydrate and coagulate the tissues of the stomach with the production of an acute necrosis. If life be prolonged the dead material eventually separates and the resultant ulcer gradually cicatrizes. The extent and severity of the injury depends upon the quantity and concentration of the poison and the state of the stomach at the time of its ingestion; a relatively small dose taken when the organ is devoid of food being more destructive than a larger amount ingested after a full meal. If the corrosive was swallowed when the patient was in an erect or sitting posture the fundus and great curvature of the stomach usually bear the brunt of the mischief, but if he happened to be lying down the pharynx and œsophagus are disproportionately affected. In rapidly fatal cases the stomach is found after death to contain much mucus and altered blood and to present general hyperæmia and swelling of its tissues.

The deep red colour of the mucous membrane is most pronounced along the summits of the rugæ, while the sulci which intervene between them may be comparatively unaffected owing to the tetanic contraction of the organ which ensues from contact with the irritant. Scattered over the fundus and along the line of the great curvature one or more hard, dry, parchment-like eschars may be observed, of a black, grey, or yellow colour according to the nature of the acid. Not infrequently a large perforation is seen to exist at the site of one of these necrotic areas, the edges of which display a characteristic blackened and shreddy appearance. The islands or tracts of mucous membrane between the dead areas are intensely red, swollen, softened, and œdematous or superficially ulcerated, and in some cases the upper part of the duodenum displays similar signs of acute inflammation.

When life has been prolonged for several months the whole of the inner surface of the stomach may exhibit a peculiar

striated and glistening appearance owing to the replacement of the mucous membrane by a thin layer of fibrous tissue, while in the vicinity of the pylorus, and perhaps also in the lower end of the œsophagus, an open chronic ulcer may be visible, the repair of which has been retarded by the constant movement of the sphincters that guard the orifices. In other cases, again, the stomach appears to be dilated, puckered, or pouched, owing to an irregular contraction of its ulcerated surface.

Caustic alkalies differ somewhat in their mode of action from acids in that they liquefy the protoplasm of the cells. They consequently extend more deeply into the gastric tissues and produce areas of necrosis which are softer and less defined than in the former case. Occasionally the affected portions have the appearance of false membrane.

Metallic poisons, of which arsenic, antimony, and phosphorus are the best examples, produce a diffuse form of gastroenteritis, which in the case of the two first named may be accompanied by hæmorrhages into the mucous membrane, along with vesicles, pustules, or patches of ulceration. Phosphorus, on the other hand, excites comparatively little obvious inflammation, but gives rise to fatty degeneration of the gastric glands, with subsequent atrophy, and a similar result sometimes occurs in alcoholic and arsenical gastritis.

Symptoms.—The ingestion of a corrosive is followed immediately by a violent burning pain which extends from the pharynx to the epigastrium. Vomiting ensues within a short time attended by violent retching and the rejection of blood-stained mucus, and even shreds of mucous membrane. The face is pale, drawn and anxious, the forehead is covered by a cold sweat, and the lips and extremities are usually cyanotic. The pulse is accelerated, small and of low tension, and the respiration is quick, shallow and almost entirely thoracic. In severe cases collapse is a

prominent symptom from the outset, and after a short interval perforation of the stomach with general peritonitis may supervene. The abdomen is retracted, motionless on respiration, and extremely tender to pressure over its upper half.

The course of the complaint varies according to the nature of the poison and the quantity swallowed. If the mischief is chiefly confined to the œsophagus, the vomiting may subside within a few hours and the patient may even have a desire for food. In a case of alkali poisoning which came under my notice, the patient expressed himself as perfectly well at the end of twenty-four hours, drank milk with avidity, and complained of being deprived of solid food. Nevertheless, on the sixth day he suddenly vomited an œsophageal slough measuring 5½ inches long by 1½ inches in breadth and which included the greater part of the muscular coat of the tube. At his death six months afterward the œsophagus was found to be represented by a twisted fibrous cord. When the stomach has been extensively damaged without immediate death, the pain and vomiting gradually subside, and after the lapse of a variable period the patient is able to take semi-solid food. As a rule, however, he suffers constantly from discomfort, distention, and flatulence after meals, with troublesome constipation, or displays symptoms characteristic of gastric ulcer. Atrophy of the gastric mucosa is accompanied by an intractable dyspepsia and the disappearance of free hydrochloric acid and pepsin from the secretion. Cicatrization of an ulcer near the pylorus produces the symptoms and signs of pyloric stenosis, while occlusion of the cardiac orifice from a similar cause is attended by the indications of œsophageal stricture. It is an interesting fact that destruction of the gastric mucosa by mineral acids is often followed by acute phthisis (Fenwick).

Sulphuric, nitric, chromic, formic, and oxalic acids are

very apt to give rise to secondary inflammation of the kidneys and sometimes to anuria.

Diagnosis.—The sudden onset of violent gastric symptoms in a healthy individual must always suggest an acute toxic gastritis, and in most instances inquiries will elicit the nature of the poison. In other cases, the appearance of the mouth and throat or the characters of the vomit will indicate the irritant that has been swallowed. In every case the vomit should be collected and submitted to a careful analysis. For the symptoms characteristic of the different forms of poisons the reader is referred to the text-books on toxicology.

Treatment.—Vomiting rarely removes all the poison which has gained access to the stomach and consequently, whenever it is possible, steps should immediately be taken to wash out the viscus. A tube should never be passed down the œsophagus when there is reason to suppose that mineral acids, caustic alkalies, or carbolic acid have been swallowed, or when excessive pain or hæmorrhage indicates that considerable damage has already been inflicted upon the œsophagus or stomach. For the antidotal treatment of the various irritants the reader should consult a treatise upon poisons. The after-treatment of the case is essentially the same as that adopted in severe cases of simple gastritis. As regards the consequences of the disease, œsophageal stricture will probably have to be subjected to gastrostomy, stenosis of the pylorus, to daily lavage, and eventually to gastro-enterostomy, while general atrophy of the stomach must be treated on the same lines as those laid down for other forms of that complaint.

(2) CHRONIC GASTRITIS

It is a universal belief among medical practitioners that chronic inflammation of the stomach is one of the most frequent causes of indigestion, and, indeed, is responsible

for the majority of the cases in which pain or discomfort after food cannot be attributed either to atony, cancer, or ulcer. The term "catarrh" or "chill" of the stomach has consequently attained an important place in the nomenclature of gastric diseases and is considered by the lay mind to explain the origin of almost every symptom arising from a disorder of the digestive organs. As a matter of fact, however, the systematic examination of the stomach by modern methods has incontestably proved what isolated writers have asserted for many years, namely, that chronic gastritis, except when due to the abuse of alcohol, is a comparatively rare complaint, and always indicates serious organic disease of some important organ of the body. Instead of being regarded, therefore, as a disorder of little importance and easy of recognition, a diagnosis of chronic gastritis should never be made without considerable hesitation and a thorough knowledge of its significance. Among my thousand cases of dyspepsia, chronic gastritis was found to be responsible for the symptoms in 14·4 per cent. of those treated in hospital, and in 12·4 per cent. of those observed in private practice.

Etiology.—Although chronic gastroenteritis is an extremely common complaint among the children of the poor (Chapter VIII), simple inflammation limited to the stomach is practically never encountered until after the age of five, and is rare until puberty. From about thirty years onward it steadily increases in frequency and is one of the commonest causes of the dyspepsia of old age. Males are far more prone to suffer from it than females, the ratio of the two sexes in my statistics being nearly 7 to 3. Some authorities consider that heredity exerts a notable influence on its incidence, but it would seem more probable that the inheritance of gastric myasthenia or a congenital weakness of the gastric ligaments which produces gastroptosis are of greater etiological importance. The disease may either ap-

pear as a primary affection of the stomach or it may develop as the result of organic mischief of the stomach itself or of some other viscus. The two varieties occur with almost equal frequency, the primary form constituting 45 per cent. and the secondary 47 per cent. of the cases that I investigated. In the remaining 8 per cent. the origin of the complaint could not be determined.

Primary Chronic Gastritis.—This variety rarely ensues from the simple acute form but it is an invariable result of destruction of portions of the mucous membrane by corrosives and other poisons. Injudicious alimentation is usually held to be responsible for the majority of the cases of chronic gastritis met with during the first three decades of life, and may undoubtedly give rise to the complaint if persisted in for a long period of time. Frequent overloading of the stomach with indigestible or fermentable articles of food is particularly pernicious, and its effects are considerably enhanced by a rapid growth of the body. Young adults, who from habit or necessity consume their food hurriedly, are apt to fall victims to the complaint as also are those who are unable to masticate properly owing to deficient or defective teeth. In such cases the large masses of food which find their way into the stomach prove difficult of solution by the gastric juice, and becoming stagnant in the viscus act as irritants. In like manner the hasty swallowing of farinaceous materials prevents their due incorporation with saliva and favours subsequent fermentation. But of all the exciting causes of the disease, the frequent ingestion of substances that possess toxic properties is by far the most important. Thus in my series of observations it was found that the constant abuse of alcohol was responsible for no less than 60 per cent. of all cases of primary chronic gastritis, the percentage being larger in private than in hospital practice owing to the greater proportion of spirit drinkers met with among the

wealthier classes. Occasionally eau de cologne and other scents and even methylated spirit are responsible for the production of the disease. Next to alcohol, tobacco is probably the most frequent cause of the complaint. Chewers of the weed are more prone to suffer than ordinary smokers, but the habit of inhalation is almost as deleterious. In many cases where I have been puzzled to explain the existence of chronic gastritis in a woman, the patient has eventually confessed to excessive indulgence in tobacco inhalation. Idiosyncrasy plays an equally important part in the production of chronic toxic gastritis as in that of other diseases, and a dosage of alcohol, tobacco or other drug which has little or no deleterious influence upon one individual will induce severe gastric inflammation in another. The long-continued administration of certain medicinal remedies, such as cubebs, copaiba, sandalwood oil, arsenic, silver, mercury, quinine, iodides and salicylates, nitroglycerin, cocain, morphine, etc., is occasionally responsible for an intractable gastritis, the origin of which may escape notice unless particular inquiries are directed to the subject. The dyspepsia which often follows severe gonorrhœa is almost always due to sandalwood oil or other remedy which the patient has taken upon his own initiative. The abuse of purgatives has always been held to produce chronic inflammation of the stomach, but, according to my experience, the various saline aperients should be excepted from this indictment. Strong tea and coffee produce gastritis in certain individuals, while highly spiced foods, condiments, sauces, and pickles certainly aggravate, if they do not excite, the inflammatory process. According to American writers, the habit of taking large quantities of ice-water is responsible for its undue prevalence in the United States.

Secondary Chronic Gastritis.—Chronic gastritis almost invariably complicates such diseases of the stomach as

cancer, sarcoma, simple ulcer, myasthenia, gastroptosis, hypersecretion and lardaceous degeneration, and is directly responsible for many of the more prominent symptoms

AN ANALYSIS OF ONE HUNDRED AND FIFTY CASES OF CHRONIC GASTRITIS, SHOWING THE RELATIVE FREQUENCY OF ITS VARIOUS CAUSES

Primary form (45 per cent.)		Secondary form (47 per cent.)	Cause undetermined (8 per cent.)
	Per cent.		Per cent.
Alcohol	60	Disease of lungs	27·6
Errors of diet and mastication	17·9	Disease of kidneys and bladder	21·4
Drugs	13·3	Long-standing gastric myasthenia	18
Tobacco	8·8	Diseases of heart	12·8
		Portal obstruction	6
	100·0	Anæmia, leucæmia, diabetes	6
		Rheumatism	4·2
		Septic states of mouth, etc.	4
			100·0

that accompany these various conditions. In such cases little difficulty exists in determining the nature of the primary disease and of ascribing the inflammatory trouble to its proper cause. Quite different, however, is the aspect presented by chronic gastritis when it arises from disease of an organ remotely situated from the stomach. Thus in many cases of phthisis the symptoms of the secondary gastritis overshadow or even completely replace those arising from the pulmonary complaint, while in certain diseases of the urinary tract much experience and discrimination are often required to demonstrate the connexion between an apparently trifling affection of the kidneys or bladder and an intractable form of dyspepsia (Chapter IX).

In my statistics, diseases of the lungs and urinary organs together were responsible for nearly one-quarter of all the cases of chronic gastritis.

Of the pulmonary complaints, phthisis with cavitation, bronchiectasis, and chronic empyema are most frequently

complicated by gastric inflammation, and in each of these diseases it will be observed that septic absorption is a prominent phenomenon. As the result of some experiments I was able to prove that the expectoration in chronic phthisis contains an albuminous substance which when injected subcutaneously into animals produces a severe gastro-enteritis. It is probable, therefore, that the inflammation of the digestive tract which so frequently accompanies purulent diseases of the lungs and pleuræ is due to an auto-intoxication. In chronic Bright's disease the mucous membrane of the stomach and intestines help to eliminate the urea and other products of metabolism that are retained in the blood, but in so doing the peptic and intestinal glands fall victims to their own vicarious activity and become affected by chronic inflammation (Chapter IX). The same result ensues, though in a lesser degree, from deficient elimination of the urine owing to enlargement of the prostate, pressure upon the ureters, stricture of the urethra, or pyelitis.

In about 19 per cent. of the secondary cases the gastritis was found to depend upon chronic venous congestion of the stomach induced either by failure of the heart (12·8 per cent.) or by obstruction of the portal vein (6 per cent.). The persistent engorgement of the gastric mucous membrane which results from these conditions not only diminishes the vitality of the tissues, but, by adversely affecting both secretion and motility induces stagnation and fermentation of the food with consequent irritation of the inner surface of the viscus. This category also includes the gastritis which arises from failure of the right side of the heart in cases of emphysema, interstitial pneumonia, and other diseases which embarrass the pulmonary circulation.

In 18 per cent. of the cases long-standing myasthenia, either primary or secondary, was responsible for the symptoms of chronic gastric inflammation; while in 6 per cent. diabetes or some disorder of the blood, such as anæmia,

leucæmia, or purpura, appeared to be its exciting cause. Finally, it may be mentioned that in 4·2 per cent. the gastric disease was attributed, either rightly or wrongly, to the presence of severe rheumatism, and in another 4 per cent. to septic states of the mouth or nares.

The last-named estimate will appear ludicrously small to those medical and dental practitioners who are at present inclined to attribute almost every disorder of the digestive tract to septic conditions of the gums and teeth; indeed, it is comparatively rare for me to see a patient suffering from chronic indigestion who has not had the teeth removed for "pyorrhœa." Out of one hundred cases where total extraction was stated to have been performed for the cure of indigestion, I found seven examples of advanced carcinoma of the stomach, two of carcinoma of the rectum, nineteen of duodenal ulcer and fourteen of gastric myasthenia or neurasthenia, while the remainder consisted of chronic gastritis, colitis, or hypersecretion dependent upon one or other of the organic diseases which produce them. It is, of course, perfectly true that the continued absorption of products of inflammation at the roots of the teeth may give rise to *gastritis*, in the same manner that suppuration in any tissue of the body can produce the disease; but to remove useful teeth with the expectation of curing organic diseases of the digestive organs always appears to me to be less likely to achieve its purpose than the removal of the stomach itself. There is no more evidence that swallowing minute quantities of "germs" or "pus" from the gums can produce functional or organic diseases of the stomach than that the ingestion of infective mucus from the nose and throat is a common cause of dyspepsia or ulcer. On the other hand, it is quite certain that the genuine pyorrhœa which occurs during the course of such diseases as gastric cancer, chronic cholecystitis and ulcerative colitis is usually secondary to these diseases. To extract the teeth in these

latter conditions, when the state of the patient permits the operation, promotes hygiene of the mouth and often aids the appetite although it fails to influence the original complaint.

Pathology.—The stomach is usually found after death to be somewhat dilated, and its inner surface covered by a thick layer of mucus, which is particularly abundant and tough in the pyloric half of the organ. When this has been removed, the mucous membrane presents a curious slate-grey or brownish-black pigmentation, which, when examined through a lens, is seen to consist of numerous fine black dots. In the central and cardiac portions of the viscus, in addition to signs of post-mortem digestion, there is always some degree of superficial vascularity, while not infrequently the surface is studded with punctiform hæmorrhages or hæmorrhagic erosions. The coats of the organ are always thickened, and the mucous membrane may be peeled off the subjacent muscular tissue in the form of large strips of leathery consistence. In the pyloric region the various coats are often so closely welded together as to be indistinguishable one from another. Occasionally, the mucosa in the vicinity of the pylorus is beset by a number of minute elevations arranged in the form of patches or streaks, and in rare instances the whole of the interior of the stomach is affected in a similar manner. Sometimes these excrescences attain a considerable size, and form hemispherical or polypoid tumours attached to the surface by short stalks. This abnormal condition (the " état mamelonné " of Louis) is due to the contraction of the newly formed fibrous tissue situated between the peptic glands and a hyperplasia of the glandular elements. Another result of chronic gastritis is a peculiar honeycombed appearance of the mucous membrane, to which Trousseau gave the name of " l'estomac à cellules." In this condition the inner surface of the organ presents numerous little pits separated from one

another by narrow ridges of pigmented tissue or fine fibrous bands, and thus closely resembles the interior of the urinary bladder in a case of chronic cystitis.

The microscopic appearances vary considerably according to the causation and the duration of the complaint. As a rule, the superficial epithelium is represented by clumps of granular, shrunken, distorted or vacuolated cells, while that which lines the mouths of the ducts shows a great excess of the goblet variety. The glands themselves are swollen, tortuous, indistinct in outline, and frequently exhibit cystic dilatation of their blind extremities. The parietal and peptic cells are indistinguishable from one another, their nuclei are obscured, and the lumina of the tubes are blocked by granular débris and particles of fat. In all cases the interglandular connective tissue is more or less densely infiltrated by small round cells, among which may be recognized red blood corpuscles and newly formed spindle cells. The small blood-vessels which ramify between the glands and in the submucosa are much dilated, and here and there recent extravasations of blood may be detected. The intermuscular connective tissue is also affected by a round-cell infiltration.

With the progress of the disease the inflammatory exudation between the glands undergoes gradual organization, with the result that the tubules become pressed upon, twisted and occluded so that they either disappear altogether from the section or are represented by a series of minute cysts lined by a single layer of columnar epithelium (Figs. 10, 11). A similar process in the submucous coat leads to the formation of dense fibrous tissue, with compression and destruction of the strands of muscle tissue; while in the middle coat of the organ progressive thickening of the septa produces an initial hypertrophy, followed by atrophy and finally by a fibrosis of the contractile structure. This short sketch is sufficient to indicate that chronic inflamma-

tion of the stomach sooner or later affects both the interstitial and the glandular elements of the mucous membrane, compressing and destroying the latter, and finally leading to partial destruction of the muscular coat.

Symptoms.—The disease usually develops in an insidious manner and several months may elapse before the characteristic symptoms make their appearance. Occasionally, however, it commences in a more abrupt fashion by an attack of acute or subacute gastritis, which instead of subsiding gradually merges into the chronic disorder.

When fully developed the complaint presents a series of symptoms which, considered in their entirety, are extremely characteristic. Discomfort rather than pain is experienced during the periods of gastric digestion, and is attended by abdominal distention, eructations of gas or acid fluid, nausea, and extreme lassitude. Vomiting may occur at intervals, and is especially common in the early morning, when a violent attack of retching culminates in the expulsion of a little stringy or glairy mucus from the stomach. The bowels are confined or irregular in their action, and there is a constant feeling of oppression in the head, physical and mental exhaustion, and depression of spirits, accompanied, as a rule, by thirst, diminution of appetite, and an unpleasant taste in the mouth. The facial expression is anxious and careworn, and the sallow, wrinkled condition of the skin gives the individual an appearance of premature age.

Epigastric discomfort is an important symptom in every case and the one upon which most stress is usually laid. As a rule, it takes the form of an unpleasant weight or fullness in the region of the stomach, which ensues about an hour after a meal and causes the patient to feel distended or bloated. It is often associated with an aching or dragging sensation between the shoulders or pain in the throat or muscles of the neck. The intensity of the symptom varies

according to the composition of the meal. Liquids usually cause less discomfort than solids and small quantities of food of a digestible nature agree better than a large repast consisting of meat and vegetables. The fact that a dose of alcohol or other diffusible stimulant affords immediate relief is one of the reasons why a sufferer from chronic gastritis so frequently becomes addicted to over-indulgence in spirits, even though formerly he had been most temperate in this respect.

Discomfort during the progress of digestion is also a common symptom of gastric myasthenia and neurasthenia, but in these disorders it usually develops immediately after the meal and is aggravated rather than relieved by a liquid diet. The absence of true pain in uncomplicated chronic gastritis serves to distinguish the complaint from ulcer of the stomach, hypersecretion, and the painful neuroses.

Nausea is a frequent but by no means invariable symptom and is more common in women than in men. In its most distressing form it occurs in the early morning, when it is often accompanied by faintness or vertigo, but is immediately relieved by vomiting. It is also apt to ensue two or three hours after a meal or it may only develop when the stomach is devoid of food. In the latter case the feeling of sickness is sometimes replaced by one of sinking or depression at the epigastrium or by severe giddiness. As a rule the liability to nausea and vomiting varies in inverse ratio; persons who vomit easily suffering but little from nausea, while those who only empty their stomachs with difficulty experience an inordinate sense of sickness.

Vomiting is a variable symptom of chronic gastritis and is most frequently observed when the disease is due to the abuse of alcohol or other toxic poison. In its most characteristic form it occurs in the early morning when the patient rises from bed and is usually preceded by nausea, giddiness, or faintness. A violent attack of retching ter-

minates in the expulsion of a small quantity of thick, ropy mucus, which is so tenacious that it has to be dragged from the mouth by the fingers. This so-called *vomitus matutinus* consists partly of mucus secreted by the inflamed stomach and partly of saliva that has been swallowed during the night, mixed perhaps with a small quantity of yellow bile. Although most frequent in alcoholic gastritis, a similar form of vomit is also observed in that due to chronic renal disease, pregnancy, and chronic phthisis, but in the last-named the act of emesis is always excited by a fit of coughing.

Vomiting also ensues occasionally during the day, and in the later stages of alcoholic gastritis this form of emesis is of frequent occurrence. An unduly large meal or one that consists principally of solid food is particularly apt to be rejected. This symptom usually subsides when the patient is confined to bed and only partakes of liquid nourishment.

The vomit obtained after meals is, in its way, quite as characteristic as the vomitus matutinus. Rather abundant in quantity, it presents the appearance of a slimy mass containing numerous pieces of food which exhibit no signs of digestion. The mucus is uniformly distributed throughout the ejecta and each particle of meat or bread is completely coated with the viscid material. These features serve at once to distinguish mucus secreted by the stomach from that produced by the throat, nose, or larynx and subsequently swallowed, since the latter appears in the form of balls of a glassy or purulent character which float about in the liquid. Normal gastric juice digests mucus with difficulty, and when the hydrochloric acid is deficient in amount, the mucus secreted by the stomach tends to swell and to become glairy. It has been shown by Schmidt that the quantity of mucus secreted is inversely proportionate to the amount of hydrochloric acid present in the gastric juice; consequently excess of mucus in the vomit connotes

a diminution of the gastric secretion. Although acid in reaction, the total acidity of the filtered vomit is always much diminished, free hydrochloric acid is absent, and both the combined acid and the total chlorides are reduced in amount. Lactic acid is rarely encountered in primary chronic gastritis.

Flatulence is always a prominent symptom, and large quantities of gas are eructated at intervals during the progress of digestion. The gas consists principally of carbon dioxide, mixed with varying amounts of nitrogen, hydrogen, and methane. Flatulent distention of the intestines with the intermittent passage of large quantities of flatus is a very distressing symptom in some cases.

Regurgitations of sour fluid or of particles of acid food is a common source of complaint, but true pyrosis, which is due to the passage of a hyperchloracid gastric juice into the œsophagus and pharynx, is never encountered. On the other hand, *waterbrash* is by no means an infrequent symptom of chronic gastritis, the regurgitant fluid possessing an insipid or slightly saline taste and a neutral reaction. It is usually preceded by a cramping or stabbing pain in the left hypochondrium.

The *appetite* is usually diminished, especially in the primary variety, but it is sometimes very capricious and a strong inclination may be expressed toward certain highly spiced, salt, or acid articles of diet. In other instances a feeling of sinking in the region of the stomach is experienced comparatively soon after a meal, or an apparent appetite is allayed by the ingestion of a few mouthfuls of food.

Thirst is often a conspicuous symptom, especially during the night and between meals, while occasionally a patient will imbibe large quantities of fluid at short intervals with the view of allaying the sense of epigastric exhaustion or of internal heat from which he constantly suffers.

The *breath* is sickly and offensive and a disgusting taste

in the mouth may be experienced upon rising from bed in the morning. When a foul odour of the breath ensues only at the height of gastric digestion, it is usually the result of an abnormal putrefaction of the food, but if it be permanent it is often due to chronic inflammation of the throat, nose, or gums. An *excessive flow of saliva* is not uncommon, particularly at night, when it dribbles from the mouth during sleep and soaks the pillow.

The state of the *tongue* varies according to the cause of the gastritis. In the alcoholic variety it is usually moist, flabby, covered with a greyish-yellow mucus and indented along its margins by the teeth ; or the thick yellowish coating is confined to the posterior half of the organ, the anterior portion being clean, red, and pointed. A dry, clean tongue frequently accompanies the gastritis of renal disease, while in the other secondary forms of the complaint the organ presents no characteristic appearance.

The *heart's action* is slow, feeble, or even irregular, and with the progress of emaciation the pulse loses tone and tends to increase in frequency unless renal disease exists with high blood pressure.

In the early stages of the complaint the *bowels* are usually confined and the stools are pale, hard, scybalous, coated with mucus, and extremely offensive.

Subsequently, *diarrhœa* is apt to alternate with periods of constipation, when several liquid, pultaceous, or frothy motions are voided in quick succession, attended by much flatus and griping pains in the abdomen. Piles often develop before any enlargement of the liver can be detected.

The *urine* is diminished in quantity and deposits urates or oxalates on standing.

The *nervous system* participates markedly in the general disturbance. Constant lassitude, an inability to concentrate the attention, impairment of memory, and excessive restlessness or irritability are frequently observed. In

other cases vertigo, curious sensations of fear during the periods of digestion, mental depression, or even hypochondriasis are prominent features of the case. Many patients suffer constantly from pain or a sense of tension and oppression in the head, or a dull, aching feeling is experienced in the muscles of the extremities or along the course of some important nerve. Occasionally these latter symptoms are so severe that the case is regarded as one of chronic rheumatism, sciatica, or neuralgia, while the gastric complaint, which is the cause of these phenomena, is overlooked. Palpitation of the heart, epigastric pulsation or attacks of the so-called asthma dyspepticum are apt to ensue after meals and greatly add to the general discomfort. Insomnia is very common, and when sleep is at length attained after hours of restlessness, it is usually disturbed by nightmares or sensations of unaccountable panic.

The *skin* presents various indications of the perverted general nutrition. It is usually dry, harsh, sallow, and wrinkled, while at times an eczematous, impetiginous, or urticarial eruption makes its appearance without assignable cause. It is interesting to notice that inflammation of the skin is usually associated with a marked diminution of the gastric symptoms (Trousseau, Fenwick).

The *hair* tends to become dry and prematurely grey, and usually falls out rapidly as soon as progressive emaciation sets in. The nails become furrowed and are easily split, the teeth often suffer from rapid caries, and pyorrhœa may exist.

Coldness of the extremities is a common cause of complaint and is sometimes attended by flushing of the face and a sense of fullness or oppression in the head. In some cases slight *shivering attacks* occur from time to time and the patients are unduly susceptible to changes of temperature. Chilblains are very common. Although the temperature of the body is usually subnormal, certain subjects

of chronic gastritis exhibit from time to time a *slight febrile reaction* at night accompanied by chilliness and a feeling of general malaise. During these attacks there is a marked exacerbation of the dyspeptic symptoms and vomiting is not infrequent. Exposure to cold or indulgence in alcohol or some indigestible article of food is usually responsible for these intercurrent attacks of acute or subacute gastritis.

Emaciation is always observed when the disorder has persisted for any length of time, but it is not an early symptom unless the patient has been previously out of health or the disease is unusually severe. More often there is a gradual but steady loss of flesh and strength, combined with that curious loss of energy which so often betokens organic disease of the stomach.

Physical Examination.—During digestion the stomach is frequently distended with gas and produces a visible protrusion of the epigastrium. This varies in degree at different periods of the day and is always most noticeable in the evening. On palpation the exposed portion of the viscus is found to be hyperæsthetic, but the localized tender area met with in cases of ulceration is absent. Except in those rare examples of pyloric stenosis due to hypertrophy of the mucous membrane near the orifice, the gastric walls present no evidence of thickening nor can any peristaltic movements be observed after manipulation. A certain degree of gastrectasis may usually be detected after the disease has lasted several months, owing to the constant stretching of the walls of the organ by the gaseous products of fermentation and perhaps to the extension of the inflammatory processes to the muscularis mucosæ, but the great curvature rarely extends more than 1 inch below the level of the navel. An exception to this rule is to be found, however, in the gastritis of chronic phthisis, where lardaceous disease of the tissues of the stomach is accompanied by great dilatation of the organ.

An investigation of the secretory powers of the stomach is always a matter of great importance and should be conducted after the administration of a test-breakfast. As a rule, the amount of material extracted by aspiration at the end of an hour is in excess of the normal and consists of a thick, slimy mass which filters with difficulty. It is important to observe that the mucus is always intimately mixed with the food and that each coarse particle of bread is enveloped in a tenacious coating of slime. These appearances serve to distinguish the mucus secreted by an inflamed stomach from that produced in the nose, larynx, or throat, which after being swallowed is removed from the stomach in the form of isolated glassy or purulent balls. The fact that a stomach affected by chronic inflammation secretes an abundance of mucus can also be demonstrated by washing out the organ in the early morning, when at the end of siphonage a large quantity of stringy slime will escape through the tube. Microscopic examination of the mucus reveals the presence of numerous round cells and various forms of micro-organisms, mixed occasionally with casts of the peptic glands (Fenwick), spiral cells (Jaworski), or shreds of mucous membrane (Einhorn).

The filtered material obtained after a test meal always shows a decided diminution of the gastric secretion. Free hydrochloric acid is either absent altogether or only exists in minute quantity, while the total acidity of the fluid is much less than normal (20–50). Traces of lactic acid may occur in advanced cases and the volatile acids are usually increased. When atrophy of the mucous membrane takes place the total acidity steadily diminishes and finally the acid secretion disappears altogether. It should never be inferred, however, that a low total acidity, combined with an absence of the free acid, indicates the existence of atrophy, since free hydrochloric acid often reappears after the case has been under treatment for a short time, while the total

acidity of the filtrate is always liable to considerable fluctuations. It is only after repeated examinations that an accurate estimate of the secretory activity of the stomach can be formed.

The pepsin is always reduced in severe cases, but it is only when extensive atrophy has taken place that the ferment fails to be secreted. Rennet is also reduced in quantity, but to a lesser extent than either the acid or pepsin. According to Boas, the quantitative estimation of the rennet-zymogen is of much clinical importance, since a marked diminution of the ferment always indicates a severe and intractable form of gastritis. The easiest method is to introduce into the stomach a graduated solution of hydrochloric acid, and, after allowing it to remain in the organ for a certain time, to remove it by aspiration and to determine the amount of the enzyme in the fluid in the usual way.

Motor insufficiency is usually supposed to be the cause of the tardy digestion of food in cases of gastritis, but this supposition is often erroneous. In most instances the presence of undigested masses of food in the stomach several hours after their ingestion is due to the diminished activity of the gastric secretion, while the excess of mucus constitutes an almost impenetrable barrier to the proper incorporation of ingesta with the digestive fluid. On the other hand, it is probable that in many cases of chronic gastritis this tendency to food stagnation is to a great extent counteracted by an increased peristalsis of the stomach, whereby its undigested contents are hurried into the intestine and submitted to digestive processes of a more active character than those existent in the inflamed organ. This fact is easily proved by noting the rapidity with which milk and other fluids escape from the stomach into the bowel, while solid articles of diet remain stagnant for many hours. At a late stage of the disease the motor power invariably fails

and the organ shows signs of dilatation. These facts may be corroborated by an X-ray examination.

Course and Prognosis.—The disease always pursues a chronic course, and in some instances several years elapse before the general nutrition shows signs of serious failure. As a rule, the course of the primary complaint is marked by many remissions and exacerbations, which depend for the most part upon the varied activity of its exciting cause. This is particularly the case in the gastritis of alcoholism, which may subside for months when the habit is given up, to break out with renewed severity when the patient once more indulges his drinking propensities.

The two great local factors which prevent the cure of gastric inflammation, even when the exciting cause has been removed, are embarrassment of the circulation and impairment of the motor power of the viscus. The former usually arises from coexisting cirrhosis of the liver, the gradual contraction of which causes an ever-increasing obstruction to the circulation of blood through the portal vein and engorgement of the venous system of the stomach. Motor insufficiency occurs at a late stage of the primary complaint and is due to excessive stretching of the musculature of the organ combined possibly with the spread of the inflammation into the middle coat. When this complication develops, fermentation of the food becomes a prominent symptom, the compensatory digestive activity of the intestines is destroyed, and the failure of absorption leads to a rapid deterioration of the health.

Secondary chronic gastritis being almost always a sequela of organic disease of some important organ of the body rarely undergoes spontaneous cure, and by seriously interfering with the general nutrition, materially hastens the fatal termination of the original complaint.

Diagnosis.—To judge from the frequency and readiness with which the majority of practitioners are wont to diagnose

" chronic gastritis," it might easily be imagined that the recognition of the disease presents few difficulties and that its existence is a matter of little importance. But even the most casual consideration of its etiology is sufficient to show that, whereas the primary form is almost invariably due to serious toxic poisoning, the secondary and more common variety bespeaks an incurable organic disease either of the stomach itself or of some other vital organ of the body. Moreover, it is generally conceded by experts that the symptoms and physical signs that accompany chronic inflammation of the stomach are in no way pathognomonic and that several examinations of the gastric secretion have to be made before definite conclusions can be drawn from them. It is obvious, therefore, that while the diagnosis of chronic gastritis must always entail much careful consideration, a complete examination of all the organs of the body has to be made before the cause of the disease can be ascertained and a prognosis formulated.

The existence of chronic gastritis may be inferred from the following symptoms and physical signs: (1) Discomfort and distention occurring within an hour or two after a meal consisting of meat or other solid material. (2) Eructations of gas and occasional pyrosis during the period of gastric digestion. (3) Vomiting of glairy mucus in the early morning, preceded by severe nausea and retching. (4) Occasional vomiting after meals, the constituents of which are enveloped in mucus and present little or no signs of digestion. (5) Mental depression and other nervous phenomena out of all proportion to the apparent failure of digestion and absorption. (6) After a meal the stomach is found to be distended with gas, and in old-standing cases a moderate degree of gastrectasis is often present. (7) As the result of several test-meals, the particles of bread are found to be undigested and to be enveloped in a thick coating of slimy mucus; free hydrochloric acid is absent, the

total acidity of the chyme is much diminished, and the secretion of both pepsin and rennet is deficient.

The principal complaints from which primary chronic gastritis has to be distinguished are carcinoma, myasthenia, and neurasthenia of the stomach.

Cancer of the stomach is very prone to be accompanied by chronic inflammation of the gastric mucosa from an early period of its development, and it may not be until the occurrence of certain special symptoms that the secondary nature of the gastritis becomes apparent. It is, therefore, wise to regard with suspicion every case of chronic gastritis occurring after middle life until its cause can definitely be determined. Both carcinoma and chronic gastritis commence in an insidious manner, but the course of the former disease is relatively rapid, and severe general and local symptoms usually develop long before a simple gastritis would have had time to affect the general nutrition in like degree. Thus, loss of energy and strength are early phenomena of the morbid growth and emaciation and anæmia proceed unchecked throughout the whole course of the complaint. Pain during digestion is a constant feature of cancer of the body of the stomach; and even when the pylorus is primarily affected, this symptom soon makes its appearance owing to ulceration of the growth. Early morning vomiting is rare in cases of cancer, but emesis at other times of the day or when the patient retires to bed at night is a symptom that increases in frequency as the disease progresses, Hæmorrhage is met with in both, but in chronic gastritis cirrhosis of the liver is almost invariably present when the hæmatemesis is copious, while in carcinoma the bleeding is often slight, but recurs at short intervals, and a tube will frequently demonstrate the presence of altered blood in the stomach.

A considerable degree of gastrectasis, especially if associated with visible peristalsis, is always suggestive of pyloric

stenosis, while the discovery of a tumour connected with the stomach, irregular enlargement of the liver or of nodules in the abdominal wall will at once raise a suspicion of malignant disease. After a test-meal, the material removed from a stomach affected by carcinoma presents a remarkably low total acidity, free hydrochloric acid is usually absent, and the fluid often contains lactic acid. The motility of the organ is also impaired from an early stage of the complaint.

Primary myasthenia differs from chronic gastritis in several important particulars. As the complaint is essentially an enfeeblement of the muscular coat of the organ, the most noticeable phenomena are stagnation and fermentation of the food. Nausea and vomiting are never met with in uncomplicated cases, pyrosis is rare, and the characteristic vomiting of mucus in the early morning is absent. Exploration of the stomach after a test-meal shows but slight diminution of its secretory powers and an absence of that glairy mucus which is pathognomonic of chronic inflammation; the ferments present no signs of diminution, but food is retained in the enfeebled organ for a considerable time. The exciting causes of chronic gastritis are also absent.

Neurasthenia gastrica ought not be confounded with chronic gastritis. The wayward nature of its symptoms and the irregular course of the disorder should at once indicate the nervous origin of the complaint, while the absence of vomiting in the early morning, the rapidity with which the stomach empties itself after a test-meal, and the normal features presented by the chyme are sufficient to negative the suggestion of gastritis.

Treatment.—(1) *General.*—The various conditions which tend to excite or to perpetuate inflammation of the stomach must be carefully avoided, and such adverse influences as exposure to extremes of temperature, insufficient mastication of the food, abuse of alcohol or tobacco, or constant

indulgence in rich or indigestible articles of food must be guarded against. Special attention must also be paid to the condition of those organs of the body whose functional derangement is particularly apt to excite gastritis, and the treatment appropriate to diseases of the lungs, heart, liver, kidneys, or of the blood should be adopted as occasion requires. In all cases the patient should endeavour to lead a rational existence and indulge in some regular form of exercise which does not entail either over-exertion or excessive fatigue. Walking, golf, and horse riding are usually beneficial, and in many instances a tepid sponge bath on rising followed by some form of calisthenic exercise for about ten minutes is a useful adjunct to the other methods of treatment.

Lavage, or washing out the stomach, is indicated in all chronic cases where there is either an excessive secretion of mucus or stagnation with fermentation of the food. In the former case the operation is most advantageously performed in the early morning, and sufficient water should be used to ensure the complete evacuation of the mucus; but since the tenacious slime is difficult to evacuate, it is advisable to make the patient at first sit upright, then lie upon his back and finally recline upon his left side so as to permit complete washing of the entire surface of the stomach. Gentle massage of the organ during the procedure often aids the expulsion of the mucus; while the addition of bicarbonate of sodium to the water, in the proportion of a teaspoonful to the quart, renders the secretion more easy of removal. When lavage is undertaken on account of fermentation of stagnant food, it may be performed either in the early morning or three hours after a light evening meal. The food is first evacuated, and the stomach is then thoroughly washed out with a mild antiseptic solution, such as salicylic acid (1 in 1,000), potassium permanganate (0·05 in 1,000), resorcin, (4 in 1,000), thymol (0·5 in 1,000),

benzol (5 in 1,000), or a dilute solution of hydrochloric acid (0·05 per cent.). If vomiting is a feature of the case, lavage should be performed both morning and evening for the first ten days. After the expiration of three weeks or a month, every alternate day is usually sufficient, and if the case continues to make satisfactory improvement, it is afterwards gradually discontinued. In the majority of the cases the good effects of washing out the stomach become apparent about the third day of the treatment, when the patient experiences an increase of appetite and a marked diminution of the nausea, distention, and other symptoms of the complaint.

When lavage is discontinued, a douche may often be employed with great advantage, since the forcible spraying of the gastric mucosa appears both to stimulate secretion and also to increase the tone of the muscular coat of the organ.

For this purpose a soft tube, provided with numerous small holes at its lower end, should be used, and the water injected under pressure by raising the funnel or reservoir above the level of the patient's head. Einhorn advocates an ordinary spray apparatus to the hard-rubber branch of which a soft stomach-tube is attached. Within the latter is another soft tube of small calibre which conveys the fluid from the bottle to a vulcanite nozzle. By this means the entire surface of the stomach can be subjected to a fine spray. When the coats of the viscus require tone, water at a temperature of 65° F. is employed, but if the gastric secretion is also deficient, the addition of chloride of sodium (90 grains to the pint) is found to increase the production of hydrochloric acid (Rosenheim), while nitrate of silver (1 in 1,000) exerts a contrary effect. Chloroform water added to the douche acts as a powerful local sedative, and Fleiner states that a douche of infusion of hops or quassia is a wonderful stimulant of the appetite. In all cases where a medicated solution is employed the fluid should not

remain in the stomach for more than a minute and the viscus should subsequently be washed out with warm water. No food should be present when a douche is employed.

Electricity is only of value in long-standing cases of gastritis where the muscular coat is markedly atonic and secondary myasthenia has given rise to retention of food. In such cases regular massage of the stomach combined with hydrotherapeutic measures may be employed.

Diet.—It is impossible to formulate a definite scheme of diet applicable to all cases of chronic gastritis, since the power of digestion and assimilation varies greatly in different cases as well as at different stages of the same case. The main object to be kept in view is to prescribe food of a quality and in such quantity that the enfeebled secretory and motor powers of the stomach are in no way overtaxed. When a case first comes under treatment, and especially if it is suffering from any acute manifestations of the disease, rest in bed for ten days or a fortnight and the administration of some bland form of nourishment affords immediate relief to the pain and vomiting, checks the emaciation, and promotes restful sleep. As a rule, the food should be administered every three hours, and the fluid be restricted to half a pint on each occasion. If milk agrees, from 3 to 4 pints may be given in the twenty-four hours, but if it gives rise to discomfort it should be diluted with lime-water, sterilized, or peptonized.

In many cases sour milk prepared in the manner recommended by Metchnikoff with lactobacilline is a most excellent adjunct to the dietetic treatment, but ten days usually elapse before its good effects become apparent. Half a pint of the sour curds, well sprinkled with sugar, may be taken twice in the day. Eggs, either poached or lightly boiled, strong clear soups, meat essences and jellies,

junket, custard, peptonized cocoa made with milk, milk puddings, Benger's food, revalenta arabica, Gerrard's peptones, with toast, rusks, and butter should constitute the remainder of the dietary.

If is often stated that proteid foods should be withheld whenever the gastric secretion is deficient, but in cases of chronic gastritis the motor power of the stomach is rarely impaired until the terminal stage of the disease, and any diminution of proteid digestion in the stomach is amply compensated by an increased activity of the biliary and pancreatic secretions. Carbohydrates may also be freely given, but vegetables that contain a large amount of cellulose and all raw fruits must be excluded from the dietary. Fats are extremely valuable, especially when the general nutrition has been much reduced, and for this purpose the patient should be encouraged to take plenty of cream, butter, or dripping with his meals.

After the lapse of a fortnight, he is usually able to leave his bed and commence a more extended dietary. If the milk and other fluids agree they may still be continued in lesser quantity, and the sour milk be taken once or twice a day. The most digestible articles of food at this period of the complaint are as follows: Calf's brains and thymus, boiled cod, whiting, and plaice, oysters, scraped raw beef, tripe, sweetbreads, mashed potato, cauliflower, asparagus, toast, rusks, oatmeal, tapioca, sago, cornflower, and rice, to which may shortly be added boiled chicken, partridge or pigeon, well-stewed beef, boiled ham, calf's feet, sardines, spinach, and stewed apple. If the case continues to progress in a satisfactory manner, the diet is further enlarged at the end of another month by the inclusion of such articles as turkey, game of various kinds, underdone roast mutton or sirloin of beef, lightly grilled chops or steaks, and plain puddings. On the other hand, hard or coarse-fibred meats, pork, veal, sausages, lobster, salmon, mackerel, carrots,

salads, celery, cabbage, cucumber, pickles, cheese, new bread, uncooked fruits, and all alcoholic drinks should be prohibited.

Medicinal.—Natural mineral waters have always been held in great repute for the treatment of chronic inflammation of the stomach, and there can be no doubt that in many cases much relief is obtained by a few weeks' treatment at a suitable watering-place. Although there is little accurate knowledge concerning the mode of action of the various waters upon the digestive system, it is probable that they act much in the same way as systematic lavage, in that they wash the contents of the stomach into the intestine, aid the solution of mucus, and stimulate the gastric glands. It must also be added, that many patients will cheerfully submit to a strict régime and a thorough course of treatment at a Spa or continental sanatorium, when no amount of persuasion will induce them to follow the same principles in their own homes, and it is consequently often a matter of expediency rather than of absolute necessity that a course of mineral waters be recommended in place of the usual medicinal treatment. But before such advice is given care must be taken that the general health is sufficiently good to withstand the exertion and excitement of a long journey, and the somewhat debilitating effect of the mineral waters. In this connexion it is well to bear in mind that chronic gastritis is very often merely an expression of serious organic disease of some vital organ of the body, and that an attempt to submit a person suffering from a fatal affection of the heart, lungs, stomach, or kidneys to the orthodox treatment at a foreign watering-place, merely because chronic gastritis happens to complicate the original disorder, is wholly unscientific and frequently ends in disaster. The somewhat sinister reputation of Carlsbad as a " kill or cure " treatment is almost entirely due to the reckless manner in which medical men often

send serious and unsuitable cases thither to undergo a course of depletive treatment.

Alkaline waters are chiefly indicated in cases of secondary gastritis, where the heart, kidneys, or some other important organ of the body is seriously affected and much irritability of the stomach exists. The warm springs of Vichy are particularly valuable under these conditions, but if a somewhat milder treatment is required, the warm waters of Neuenahr may be preferred. The salt waters of Kissingen, Homburg, and Wiesbaden exert a marked effect upon gastric subacidity and are chiefly indicated during the convalescent stage of primary chronic gastritis and in that variety which ensues from long-standing myasthenia. The effect of the saline is to promote the secretion of gastric juice, to tone up the mucous membrane, and greatly to improve the general health (Dapper). In England, Harrogate and Llandrindod possess somewhat similar waters and have the advantage of a far more bracing climate.

The springs that contain sulphate of sodium in addition to the chloride and bicarbonate are chiefly of use in that form of chronic gastritis which owes its origin to diseases of the liver, gall-bladder, and pancreas, to habitual overindulgence in rich living or to the abuse of alcohol. The best waters of this kind are those of Carlsbad, Marienbad, Tarasp, and Brides-les-Bains. In all cases the water should possess a medium temperature, as the inflamed stomach is intolerant of cold or unduly hot fluids.

The indications for the administration of drugs are three in number: (1) to allay the symptoms of gastric irritation and inhibit fermentation; (2) to stimulate the appetite; (3) to correct constipation.

(1) The abdominal discomfort, distention, nausea, and other symptoms of chronic gastritis are partly due to diminished secretion and partly to direct irritation of the mucous membrane of the stomach. Both these abnormal condi-

tions subside to a great extent under daily lavage and careful dieting, but they rarely disappear completely without the administration of drugs. The carbonate of bismuth is pre-eminently valuable in these cases, and may advantageously be combined with bicarbonate of sodium (15 grains of each) and from 8 to 12 minims of the glycerin of carbolic acid. The further addition of a drachm of pure glycerin to the mixture increases its antiseptic properties and also appears to stimulate the gastric secretion. The medicine is given between the meals, and should nausea be a troublesome feature, a few drops of dilute hydrocyanic acid may be added to it with benefit. In less severe cases the solution of bismuth may be prescribed in a similar combination. Morphine is only necessary when acute gastritis accompanied by excessive vomiting complicates the chronic complaint, and is contraindicated by the presence of albumin in the urine. In gastritis of alcoholic origin 15 grains of chloretone in capsules or a drachm of the elixir in an alkaline mixture is often attended by very satisfactory results. Some authorities speak highly of salicylate of sodium as an antiseptic, while others prefer the capsules of salicylic acid, but, according to my experience, they are much inferior to carbolic acid. A drachm of the solution of perchloride of mercury administered three times a day after meals for two months is an excellent antiseptic when the gastritis is accompanied by alcoholic cirrhosis of the liver. If acidity is the chief cause of complaint, the compound lozenges of bismuth, Alocol or capsules containing calcined magnesia and bicarbonate of sodium taken an hour after food rarely fail to relieve the symptom.

(2) The best stimulant to the appetite is afforded by the systematic removal of the mucus by lavage; but when this procedure cannot be carried out, recourse must be had to such drugs as are supposed to excite a desire for food. In

many instances a cupful of beef tea or of hot water taken a quarter of an hour before a meal excites a certain amount of relish for the food, or 15 minims of dilute hydrochloric acid in 2 ozs. of water may be taken half an hour before meals with good effect. Condurango has long enjoyed a considerable reputation as a stomachic, and a teaspoonful of the wine or 30 minims of the liquid extract may be prescribed before each meal, either with or without hydrochloric acid.

Orexin is usually too irritating to be borne by an inflamed stomach, while nux vomica, iron, quinine, and the various so-called gastric elixirs almost always increase the inflammatory mischief. The fact that a deficiency of the mineral acid is always accompanied by a diminution of the peptic ferment has led to the introduction of pepsin, papain, papayotin, and the pancreatic preparations as artificial aids to digestion. Personally, I have never observed the slightest good arise from the administration of these various digestives in cases of chronic gastritis, and even takadiastase, which theoretically might be of value, is quite useless. In this respect my experience seems to tally with that of Riegel, Grote, and other clinicians who have investigated the matter from a practical stand-point.

(3) In every case of alcoholic gastritis, as well as in many of the secondary forms of the complaint, the administration of a saline each morning before breakfast is of the greatest value. As a rule, a mixture in equal proportions of the phosphate and dried sulphate of sodium answers best, but artificial Carlsbad salts, Kutnow's powder, sulphate and carbonate of magnesia, or the Rochelle salt may be prescribed; or the natural waters of Carlsbad or Marienbad may be given instead. Enough should be taken to procure two liquid motions each day, and after a few weeks the dose may gradually be diminished. The natural aperient waters, such as Apenta and Hunyadi János, are of less value.

(3) ATROPHY OF THE MUCOUS MEMBRANE OF THE STOMACH

(Synonyms—Atrophic Gastritis; Phthisis Ventriculi; Anadeny of the Stomach)

Under certain circumstances chronic inflammation of the stomach leads to fibrosis of the mucosa and complete atrophy of its secretory structure. This lesion resembles in its clinical features the nervous variety of achylia gastrica, but inasmuch as the suppression of the functions of the stomach depends upon an organic lesion, it is important that the two complaints should carefully be distinguished from each other.

Pathology.—The appearances presented by the stomach vary in different cases. In most instances the organ is somewhat dilated and dislocated downward, while its walls are abnormally thin and transparent. Less frequently it exhibits no obvious signs of disease, or it may even be smaller and thicker than in a healthy state. Neither post-mortem digestion nor ulceration is ever encountered and there is no hypertrophic stenosis of the pylorus. The inner surface of the organ has a peculiar smooth and glistening appearance, and there is a total absence of rugæ.

Microscopical examination shows that atrophy of the gastric mucosa may be of two kinds. In one the inflammatory trouble is restricted to the peptic glands, while in the other the destruction of these tubules is merely a result of a general cirrhosis of the mucous membrane. In the former case the connective tissue elements are only slightly increased and the glands appear like shrunken, wrinkled sacs that at most contain a few detached and degenerated cells. The mouths of the ducts are dilated, and the surface of the mucosa exhibits here and there a few goblet cells. The morbid changes are chiefly confined to the inner coat of the stomach, but the submucous and

muscular tunics may also show signs of atrophy. Chronic interstitial gastritis, or cirrhosis, is by far the most frequent cause of glandular atrophy. In these cases the mucous membrane is quite devoid of columnar epithelium, and often presents a peculiar villous or papillary appearance owing to the accumulation of the organized products of inflammation between the mouths of the ducts. The interglandular connective tissue is greatly increased, and its contraction causes compression and destruction of the tubules, remnants of which, in the form of small cysts, may be visible in the cirrhotic tissue (Figs. 8 and 8A). The new fibrous elements are highly vascular and contain numerous blood-vessels of recent formation. When the inflammation has spread into the deeper structures, the muscularis mucosæ is often completely destroyed, the submucous tissue is thickened and condensed, and the small arterioles that pass obliquely upward to supply the mucous membrane exhibit sclerotic changes in their inner and middle coats and are sometimes filled with thrombi. The muscular tunic is intersected by bands of fibrous tissue, and its constituent fibres appear granular and fatty. Fatty degeneration of the nervous plexuses of Meissner and Auerbach have been observed in some instances (Jürgens, Blaschko, Sasaki) and changes in the spinal cord have also been detected (Eisenlohr). Although the disease usually involves the whole stomach, it is always most advanced in the pyloric region and in the neighbourhood of the lesser curvature, while in some cases isolated patches of atrophy are scattered over the greater part of the viscus. As a rule the duodenum and colon suffer in a similar manner.

Etiology.—Samuel Fenwick was the first to call attention to the existence of atrophy of the stomach in pernicious anæmia and in certain cases of carcinoma affecting the breast, intestine, and uterus. Since the publication of these researches in 1879 the subject has attracted considerable

attention, and it is now believed that while atrophy of the gastric mucosa may occasionally occur as a primary disease, in the vast majority of cases it is the result of a chronic gastritis of local or toxæmic origin.

(1) Many *organic diseases of the stomach* are accompanied by inflammation that spreads in a centrifugal manner from the affected spot and is followed by destruction of the peptic glands. In cases of simple ulcer the mischief is limited to the immediate vicinity of the sore, but in the syphilitic and tubercular varieties atrophy may affect a comparatively large area of the mucosa, owing to the vascular changes that occur in these diseases. *Carcinoma* is invariably accompanied by a severe and widely diffused form of atrophic gastritis, and it is probably on this account that free hydrochloric acid usually disappears at an early stage of the complaint and lactic acid fermentation becomes so conspicuous. In this connexion it is interesting to observe that the severity of the gastritis seems to depend rather upon the condition of the neoplasm than upon its size, since it is found that a small growth that has undergone ulceration, especially if situated in the cardiac region of the organ, is attended by more destructive inflammation than one of much greater magnitude whose surface remains intact. In like manner carcinomata of the breast, uterus, and intestine are chiefly accompanied by gastritis when they exhibit a comparatively slow growth and are accompanied by profound cachexia. From these facts it would appear that the secondary inflammation and atrophy of the gastro-intestinal mucous membrane met with in cancer are due to the absorption of a chemical poison produced by disintegration of the morbid growth.

(2) Chronic gastritis leading to atrophy is frequently encountered in cases of chronic phthisis, bronchiectasis, cystopyelitis, and interstitial nephritis. As it occurs independently of amyloid degeneration, it is probably caused

by the general toxæmia that ensues from these diseases. Atrophic gastritis is also occasionally met with in diabetes (Rosenstein).

(3) Conditions which obstruct the portal circulation and thus produce venous engorgement of the stomach are always liable to be accompanied by some degree of atrophic gastritis. Partial atrophy is, therefore, frequently observed in valvular affections of the heart, emphysema, fibroid disease of the lungs, atrophic cirrhosis of the liver, and in cases where a tumour exerts direct pressure upon the portal vein.

(4) Pernicious anæmia is invariably accompanied by a diffuse atrophy of the mucous membrane of the stomach and intestines. The opinion expressed by its discoverer, Samuel Fenwick, regarding its causal influence upon the anæmia has been endorsed by many subsequent writers, but if one may judge from the etiology of other diffuse forms of gastroenteritis it would appear more probable that the same cause that produces the hæmolysis is also responsible for the destructive inflammation of the digestive organs.

(5) Severe gastroenteritis leading to atrophy is a common result of improper feeding in early life, and the resultant inhibition of the digestive and absorptive processes is a cause of the marasmus of infancy (Chapter VIII).

(6) Direct injury inflicted upon the stomach by the ingestion of strong acids or alkalies is always followed, if the patient survives, by cicatrization of the inner surface of the organ and a complete disappearance of the gastric glands.

(7) Finally, it would seem that an atrophy of the secretory structures of the stomach is a natural result of *old age*. In more than 30 per cent. of the stomachs removed from persons over fifty years of age who had died from various diseases I found microscopical evidence of atrophy in the pyloric region of the organ, while in people over seventy-five a large part of the organ may be affected in a similar

manner. There can be little doubt, therefore, that the so-called senile dyspepsia is caused to a great extent by retrograde changes affecting the glandular apparatus of the alimentary canal (Chapter VIII).

Symptoms.—Atrophy of the stomach rarely presents any symptoms that can be regarded as pathognomonic, and since the diagnosis depends almost entirely upon the state of the gastric secretion as determined by chemical analysis, much confusion has arisen from the indiscriminate inclusion of all cases that present a suppression of gastric juice under the term Achylia Gastrica. It has already been shown that this condition of anacidity may arise from neurasthenia, hysteria, and other nervous disorders quite independently of any organic disease of the stomach; and since the prognosis of the functional and organic varieties of achylia is widely different, it is obvious that atrophy of the stomach should be regarded as a clinical entity.

A study of the etiology of the disease indicates that cases of atrophy of the stomach may be divided into four clinical groups. The first comprises those examples of the complaint which are secondary to pernicious anæmia, the symptoms of which necessarily overshadow those of the gastric complication (Chapter IX). In the second group the atrophy is the result of chronic gastritis, and is preceded for some time by indications of that disease. A third variety ensues from destruction of the stomach by some corrosive fluid that had been swallowed either by accident or intention, while in the fourth the disease develops as a consequence of old age (Chapter VIII).

(1) *Gastric Atrophy in Pernicious Anæmia.*—This form of the complaint is equally common in the two sexes. In women it is most frequently encountered between the ages of twenty and forty, while men are usually affected at a later period of life (forty to sixty). The first indications of ill-health consist of lassitude, weakness, palpitation, and

dyspnœa on exertion. The skin and mucous membranes become markedly pale and gradually acquire a lemon tint, and from time to time attacks of pyrexia occur, which last for several days and are accompanied by an increase of anæmia and the passage of dark-coloured urine. The spleen and liver are somewhat enlarged; the blood is pale and watery, and its red corpuscles are greatly diminished in number, and present characteristic features.

The gastric phenomena that accompany these changes in the blood resemble those of chronic gastroenteritis. Loss of appetite is invariably present, and there may be a special distaste for meat; but vegetables and farinaceous substances are usually taken with a certain degree of relish. Thirst is a constant symptom and is particularly severe at night and during the attacks of pyrexia. At first fullness after meals, distention, nausea, and excessive flatulence are the chief causes of complaint, but after a time retching and vomiting occur in the early morning and after meals. The bowels are confined, and the total acidity of the urine is persistently greater than under normal circumstances. With the onset of a febrile attack all these symptoms become greatly exaggerated, and occasionally a form of gastric intolerance occurs which prevents the administration of food by the mouth. Under these circumstances nausea and retching are incessant and small quantities of alkaline and bile-stained mucus are vomited at intervals. During the final stages of the complaint the symptoms of intestinal indigestion constitute the predominant feature of the complaint. The constipation is now replaced by diarrhœa, which at first assumes a lienteric character, but soon becomes constant. Gurgling in the abdomen, griping pains, and distention of the intestines with gas add greatly to the general discomfort, emaciation sets in and the patient becomes too feeble to walk. Death ensues either from asthenia or syncope. A modern theory that attributes

pernicious anæmia to antecedent achylia gastrica ignores the gastric atrophy in the former disease and is unsupported by clinical facts.

(2) *Atrophy from Chronic Gastritis.*—When destruction of the gastrointestinal mucosa ensues from chronic inflammation due to improper food, kidney disease, phthisis, carcinoma, diabetes, or other well-recognized condition, the gradual development of inanition accompanied by diarrhœa will always suggest the supervention of atrophy; but should the antecedent inflammation of the alimentary tract have been caused by malaria or some other complaint contracted in a hot climate, the atrophic lesion of the stomach is apt to be overlooked and the symptoms attributed to the primary disease. In cases of this kind a chronic state of ill-health finds its expression in constant lassitude and debility, accompanied by a marked distaste for food, progressive emaciation, and anæmia. In most instances fullness and discomfort are experienced immediately after meals, followed by eructations of gas, flatulent distention of the abdomen, and a lienteric form of diarrhœa; but occasionally the ingestion of any kind of food gives rise to severe epigastric pain, while vomiting occurs from time to time. Examination of the blood shows a moderate diminution of the number of red corpuscles and hæmoglobin, but the characteristic changes met with in pernicious anæmia are never observed. Whatever system of feeding is adopted, the patient steadily loses flesh and strength, and not infrequently suffers from dyspnœa and faintness after exertion or from constant pain in the head, giddiness, or palpitation. Death usually ensues from pneumonia or other intercurrent disease or from asthenia.

(3) *Atrophy from the Ingestion of Corrosives.*—In most of the cases of this nature which have been recorded, the patient had swallowed, either by accident or design, a quantity of sulphuric, nitric, hydrochloric, or carbolic acid

or a strong solution of a caustic alkali. If life is preserved the violent inflammation of the stomach gradually subsides and a diffuse cicatrization of the inner surface of the viscus ensues. This sequence of events gives rise to the series of symptoms already described under the title of acute toxic gastritis.

The stage of inflammation follows immediately upon the ingestion of the irritant poison and lasts from ten days to six weeks. It is characterized by gastric intolerance. The symptoms which portray the development of atrophy from this cause are fullness and pain after meals, excessive flatulence, vomiting after meat or other forms of nitrogenous food, with great emaciation and debility. As long as the intestine is able to perform its functions loss of flesh does not of necessity occur, but as a rule diarrhœa with flatulent distention of the bowels makes its appearance within a few months and the patient gradually sinks from inanition. In two cases which came under my notice death resulted from an extremely rapid form of phthisis, and Robert has recorded a similar instance. It would, therefore, seem that a sudden and total failure of gastric digestion may so affect the general nutrition as to favour the inception of the tubercle bacillus.

Chemistry of Digestion.—If a test-breakfast be administered and the stomach aspirated one hour afterward, the major portion of the meal can be recovered. This is probably due to the gastrectasis which almost invariably accompanies true atrophy of the stomach and serves to distinguish this disease from nervous achylia where the muscular power of the stomach remains unaffected for a long period. The particles of bread which remain upon the filter-paper are somewhat swollen, but they fail to present the gelatinous appearance so characteristic of partial digestion. The total acidity of the filtrate is very slight and rarely exceeds 10, while in many cases the fluid is

neutral or even slightly alkaline. Free hydrochloric acid is entirely absent, and the combined acid either exists only in minute quantity or is completely wanting. Lactic acid can seldom be recognized, but if the stomach is much dilated a small amount may be detected. The reactions for peptone and propeptone give negative results. The most careful tests may also fail to prove the existence of pepsin and rennet, and lavage performed with a dilute solution of hydrochloric acid does not produce a medium which is capable of digesting fibrine or curdling milk after neutralization.

It is usually stated that mucus is invariably absent from the gastric contents, but this is a mistake. In all cases of atrophy secondary to chronic inflammation of the stomach mucus is still secreted by those parts of the mucous membrane which have escaped entire destruction, and Schmidt has shown that in many cases a new epithelium is formed, similar to that met with in the intestine, which covers portions of the atrophic mucosa and secretes mucus. Even when the inner surface of the stomach has been destroyed by a corrosive a certain amount of mucus can still be detected in the remnants of a test-meal and in the early morning. In cases of nervous achylia, on the other hand, the gastric contents are usually devoid of mucus.

Prognosis.—The prognosis of atrophy of the stomach depends to a great extent upon its cause. In pernicious anæmia, carcinoma of the breast and other organs, phthisis, kidney disease, diabetes, and other organic complaints the duration of life depends upon the course of the primary malady, and the most that can be said is that the failure of gastric digestion tends to hasten the fatal termination. Atrophy of the stomach resulting from gastritis of uncertain origin may exist for two or even three years; but in most instances the concomitant atrophy of the intestinal mucous membrane interferes with the compensatory action of the

alimentary canal which is of such conspicuous importance in nervous achylia, and brings life to an end within eighteen months. Extensive destruction of the stomach from corrosives usually terminates fatally within two years, while in most instances phthisis, pneumonia, or œsophageal obstruction puts an end to existence within a much shorter period of time. The influence of the atrophy in early life and old age will be considered in a separate chapter (Chapter VIII).

Diagnosis.—All varieties of chronic gastritis are apt to terminate by atrophy, and consequently diarrhœa after meals, failure of appetite, loss of flesh, anæmia, and progressive debility should always receive special attention. The diagnosis of the complaint, however, must be based upon an analysis of the gastric contents after the administration of a test-meal. The most important feature of this investigation is the marked reduction of the total acidity, accompanied by the complete disappearance of hydrochloric acid and the ferments. In certain cases lavage of the stomach may remove small shreds of tissue from the viscus, which on microscopical examination are found to consist of minute portions of mucous membrane that present the characteristic signs of interglandular gastritis with atrophy of the peptic glands (Einhorn).

Atrophy of the stomach has chiefly to be distinguished from achylia gastrica, carcinoma of the stomach, and amyloid degeneration of the gastric mucosa.

Cases of "achylia gastrica" are usually discovered by accident in persons who present no symptoms of digestive derangement. Emaciation rarely occurs until a late stage of the complaint, and is then very gradual in its progress. Anorexia, anæmia, and debility are absent, pain after food and vomiting are rarely encountered, and diarrhœa only exists if symptoms of intestinal dyspepsia have recently developed. In most instances the patient is the subject

of neurasthenia, hysteria, tabes, or some other affection of the nervous system, and there is no history of antecedent gastritis. The results of a gastric analysis are very similar to those met with in atrophy, but it can usually be noted that in achylia the remnants of the test-meal are scanty, abnormally dry, and devoid of mucus, while gastrectasis is absent until an advanced stage of the nervous complaint.

Carcinoma of the posterior wall of the stomach attended by chronic gastritis may closely resemble atrophy of the gastric mucosa in its general features. Both complaints are accompanied by anorexia, emaciation, anæmia, and symptoms indicative of gastric indigestion and by signs of moderate gastrectasis. It may usually be observed, however, that in cancer the loss of flesh and strength is much more rapid, while in the majority of cases pain after food and vomiting are conspicuous features of the disease. Constipation is far more common than diarrhœa, the epigastrium is tender upon pressure, and œdema of the feet and thrombosis of veins sometimes occur.

A test-meal shows the existence of food retention and an excessive secretion of mucus; the total acidity of the filtered contents is rarely reduced as low as 10, combined hydrochloric acid may usually be detected, the ferments rarely disappear completely, and in many instances lactic acid exists in considerable quantity. As a rule, also, altered blood is present from time to time in the stomach, and the Oppler-Boas bacillus may be detected by the microscope. X-rays may actually indicate the morbid growth.

Amyloid degeneration is invariably due either to prolonged suppuration, syphilis, phthisis, or chronic disease of the kidneys. The spleen is enlarged, albumin is present in the urine along with colloid casts, the liver is increased in size, and diarrhœa is a prominent feature of the case.

These facts considered in conjunction with the prolonged nature of the patient's illness seldom render the diagnosis a matter of any serious difficulty.

Treatment.—*General.*—It is important to preserve the strength as far as possible, and consequently over-exertion must be prohibited and the patient should be encouraged to recline on a couch or in an easy-chair in the open air and to take moderate daily exercise. Owing to his susceptibility to cold, the clothing should be warm without being unduly heavy, and exposure to wet must be avoided. The meals should be taken at regular intervals, and all solid articles of food must be minced or passed through a sieve and well masticated. As a rule, red meats are difficult of digestion and create pain, so that animal food should be restricted to well-boiled chicken, sweetbread, tripe, calf's head, sheep's brains, white fish, and oysters. Farinaceous foods usually agree well, and rice, tapioca, sago, potato, peas, lentils, and oatmeal may be employed in the preparation of soups and puddings. Soft-boiled or poached eggs are also of value, and may be given along with bread and butter, toast or biscuits. Butter and cream are easily digested if the intestine remains unaffected, but milk rarely agrees unless well diluted with lime-water or peptonized. Beer and spirits must be prohibited, but sometimes a little hock or other white wine taken with the meals helps to improve the appetite.

When anæmia is a marked feature of the case, a cautious trial may be made of small doses of arsenic and ammonio-citrate of iron, but these drugs rarely agree in cases where the atrophy has been preceded by symptoms of chronic gastritis and are very apt to excite sickness and diarrhœa. If gaseous distention occurs after meals, carbolic acid, resorcine, dimol, cyllin, or other antiseptic remedy may be prescribed, or a capsule containing 3 minims of guaiacol be administered after food. Diarrhœa is combated

by a diet of peptonized milk and cream, and a course of salicylate of bismuth and compound powder of opium.

Owing to the absence of the gastric secretion in these cases, hydrochloric acid and pepsin are usually prescribed, but unfortunately this attempt to supply the constituents of normal gastric juice and to increase the powers of digestion are rarely of much value, and when atrophy is due to gastritis the acid gives rise to pain. The sour milk prepared in the manner recommended by Metchnikoff ought to be of considerable use in these cases and should always be given a fair trial. Pancreatin, maltine, lactopeptine, and peptenzyme are disappointing in their effects.

If gastrectasis exists, lavage of the stomach should be performed each morning before breakfast, and occasionally massage and electricity are employed with advantage.

CHAPTER V

DYSPEPSIA DUE TO A DISTURBANCE OF THE NERVOUS MECHANISM OF THE STOMACH

(1) Gastric Hyperæsthesia. (2) Neurasthenia Gastrica. (3) Nervous Eructation. (4) Habitual Regurgitation

THE gastric functions are so directly controlled by the central nervous system that few diseases of the brain or spinal cord are unattended by symptoms referable to a disturbance of the stomach or intestines, while in many cases pain in the abdomen, vomiting or constipation precede in point of time the development of the phenomena characteristic of the nervous lesion. When, however, the various disorders of secretion already described are excluded from this category, few of the gastric neuroses are found to present that aggregation of symptoms which merits the term "dyspepsia." For this reason only two complaints can accurately be described as examples of nervous indigestion, namely, hyperæsthesia of the mucous membrane of the stomach and gastric neurasthenia. Inasmuch, however, as an insufficiency of the cardiac sphincter of nervous origin is attended by symptoms which are often, though erroneously, regarded as evidences of dyspepsia, it seems advisable to append a short account of this special condition under the titles of nervous eructation and habitual regurgitation.

(1) HYPERÆSTHESIA OF THE STOMACH

Under normal circumstances the various processes of digestion are not accompanied by any subjective sensations

and a healthy individual is therefore quite unconscious of his possession of a stomach; but if from any cause the secretory or motorial functions of the viscus become deranged his attention is at once attracted to his digestive organs by reason of the pain, distention, or flatulence that ensue after meals. In like manner, an exalted sensibility of the inner surface of the stomach engenders a series of morbid phenomena whenever the hypersensitive tissue is brought into contact with food or even with its own secretion in a condition of abnormal acidity.

Etiology.—Gastric hyperæsthesia probably occurs during the course of many diseases, both functional and organic. Thus, it sometimes manifests itself in cases of cerebral tumour and meningitis, and may prove a troublesome complication of locomotor ataxia, disseminated sclerosis, and chronic inflammation of the spinal meninges. In neurasthenia and hysteria it is often conspicuously present, and, in the latter complaint, an access of pain and vomiting from this cause may prove the immediate precursor of a convulsive seizure. Certain diseases of the stomach, such as ulcer, carcinoma, and syphilis, owe many of their protean symptoms to the coexistence of hyperæsthesia, while much of the pain that attends both hyperchlorhydria and hypersecretion is due to an excessive sensibility of the whole of the inner surface of the organ.

In women, prolonged lactation, menorrhagia, severe leucorrhœa, or other debilitating conditions sometimes give rise to the complaint, while mental overstrain, bleeding piles, and venereal excesses are often responsible for its development in men. The practice of masturbation in early life is, according to my experience, a very common cause of gastric hyperæsthesia in both sexes. Direct irritation of the stomach by long-continued indulgence in stimulating foods, condiments, iced water, coffee, or alcohol, or by the administration of certain drugs toward which the

individual possesses a special idiosyncrasy, such as quinine, arsenic, iodide of potassium, sandalwood oil, salicylate of sodium, etc., is sometimes responsible for an attack. Tobacco inhalation and chewing, as well as chloroform narcosis, are also common though often unsuspected causes of the disorder. A sudden return to a full diet after long abstention from solid food is always liable to be followed by hyperæsthesia of the stomach, a fact which serves partly to explain the occurrence of pain and vomiting after acute starvation and also the troublesome dyspepsia which occasionally develops during convalescence from typhoid fever.

Of all the conditions, however, which excite the disorder, chlorosis is infinitely the most important in this country, and consequently the great majority of the patients are females between fifteen and thirty years of age who have previously suffered from increasing pallor of the lips, dyspnœa, and other indications of anæmia. According to my hospital statistics, 10·2 per cent. of all dyspeptics suffer from this particular complaint, while in those relating to private practice the percentage frequency of the disease was only 1·6. This difference is not due to class influence, but merely to the fact that the complaint is so easily cured by appropriate treatment that comparatively few find it necessary to seek the advice of a specialist. As might be inferred from the relative frequency of chlorosis in the two sexes, about 92 per cent. of the cases occur in women. It would therefore appear that while gastric hyperæsthesia is often a secondary feature of some other and more important disease, its most characteristic form is encountered in young women who are the subjects of anæmia.

Symptoms.—If a case of primary gastric hyperæsthesia be carefully watched throughout its course, it will be found to present four stages of development, each of which is characterized by some feature of clinical importance.

The first or *initial* stage is accompanied by symptoms which for the most part are common to several other varieties of indigestion. In the early morning the patient complains of giddiness or faintness upon rising from bed, which is sometimes associated with flatulence, headache, nausea, or palpitation. The appetite is rarely impaired, but immediately after each meal fullness and discomfort are experienced in the epigastrium and left hypochondrium, which culminate in an aching or burning pain that tends to radiate over the adjacent parts of the thorax. Gaseous eructations occur from time to time and are followed by nausea. The bowels are usually confined, but sometimes a lienteric form of diarrhœa occurs after meals. The patient is markedly anæmic, irritable, capricious in her tastes, and suffers either from amenorrhœa or from irregularity of the catamenia. The tongue is pale and flabby, the urine copious and often phosphatic, and profuse perspirations are apt to occur after exercise or excitement.

The *second* stage of the complaint is characterized by the substitution of veritable pain for the previous discomfort. Immediately after eating a burning pain is experienced in the region of the stomach, which continues with varying severity for one or two hours, and is accompanied by nausea, flatulence, and abdominal distention. These symptoms are induced by any form of nourishment, and although most prominent after indulgence in meat they are also readily excited by hot and cold liquids and even by milk. The bowels are invariably confined, the appetite is diminished, and thirst at night is a frequent cause of complaint.

After a variable period the occurrence of vomiting ushers in the *third* stage of the disease. At first the attacks of emesis are only occasional and merely lead to a partial evacuation of the stomach; but the tendency to sickness rapidly increases until vomiting takes place after each meal and occasions the loss of the greater part of the ingesta.

This symptom presents three peculiar features: In the first place, unlike that which occurs in cases of gastric ulcer, the rejection of the food does not exert any notable effect upon the pain; and even when the stomach has been completely evacuated, the pain only subsides in a gradual manner; in other words, the inner surface of the stomach continues to ache after the immediate cause of its irritation has been removed. Secondly, although vomiting may have continued for several weeks, the patient rarely exhibits any obvious signs of emaciation, and if she be weighed regularly the loss of weight appears trifling when compared with the apparent severity of the gastric symptoms. Thirdly, unlike most other diseases in which vomiting is a prominent symptom, the appetite continues surprisingly good, and the patient will often finish a meal after vomiting the first portion of it. Occasionally, however, the appetite diminishes when the emesis develops, or the fear of inducing pain and sickness prevents the girl from indulging her desire for food. At this period the anæmia makes rapid progress, headache is frequent, and a feeling of exhaustion is experienced after the least exertion. The bowels are obstinately confined.

The advent of the *fourth* stage is heralded by a general failure of nutrition and by subsidence of the pain. This latter feature is probably due to the fact that emesis occurs immediately after food, and hence there is no time for the development of pain. If seen for the first time at this period of the complaint, the case is very liable to be mistaken for one of cerebral vomiting; but careful attention to the history will always elicit the fact that pain immediately after food had existed for some time before the attacks of emesis commenced, while optic neuritis and other evidences of cerebral disease are absent. Occasionally a severe attack of retching is accompanied by slight hæmorrhage, but true hæmatemesis is never observed. The bowels are con-

stipated, anæmia is severe, and a sense of intense weakness often obliges the patient to remain in bed. In some instances attacks of partial syncope occur from time to time and give rise to great anxiety. The ease with which the ideopathic variety of the disorder is cured by medical treatment renders a fatal termination comparatively rare, but occasionally death ensues from exhaustion or from some intercurrent affection of the lungs.

Physical Signs.—The most important indication of gastric hyperæsthesia consists of an abnormal sensitiveness to pressure of the whole region of the abdomen occupied by the stomach. When the viscus is empty the hyperæsthetic area may be localized to the left hypochondrium; but after a meal or if the organ be artificially inflated, the tender region becomes enlarged and is found to correspond exactly with the dimensions of the exposed stomach. Occasionally the skin below the left breast or beneath the inferior angle of the left scapula is also hypersensitive. On the other hand, the localized tenderness of the epigastrium so characteristic of gastric ulcer is invariably absent. The stomach itself rarely presents any signs of dilatation, and if the vomiting is excessive the viscus usually appears smaller than normal. The gastric contents obtained after a test-meal vary in different cases, being normal in character in about 60 per cent., somewhat deficient in hydrochloric acid in 10 per cent., and exhibiting moderate hyperchlorhydria in 30 per cent. Lactic acid is always absent, and the motorial functions of the organ are normal. Occasionally scybalous masses may be felt in the transverse and descending portions of the colon. Examination of the blood shows a great diminution of hæmoglobin, the percentage amount of which may fall as low as 30 in severe cases, and rarely exceeds 50.

Diagnosis.—There are two diseases with which gastric hyperæsthesia is often confounded, both of which are

unduly frequent in young and anæmic women, namely, gastric ulcer and a painful neurosis of the colon.

In *gastric ulcer* pain rarely occurs until after the completion of a meal, and unless the ulcer is situated close to the œsophageal opening it never ensues immediately a mouthful of food has been swallowed. It is chiefly induced by the direct irritation of solids, and, unlike the pain of the functional disorder, is at once relieved by a milk diet. The pain is referred to the epigastrium, which presents a small area of localized tenderness. The rest of the gastric region is free from discomfort upon pressure, and cutaneous hyperæsthesia is rarely encountered. Vomiting is much less frequent than in gastric hyperæsthesia, is only provoked by food, occurs at the crisis of a painful attack, and by ridding the stomach of its irritant contents the emesis at once relieves the pain. Hæmatemesis occurs in the majority of the cases of ulcer and is copious in amount. Rest in bed and a milk diet rapidly relieve the symptoms of the organic disease, but produce little effect in cases of hyperæsthesia. The gastric contents in cases of chronic ulcer usually exhibit hyperchlorhydria.

A painful contraction of the transverse colon excited by the introduction of food into the stomach is a very troublesome complaint in certain anæmic girls who are members of a tuberculous family or who have suffered in early life from migraine. The pain occurs immediately after food, is often very severe, and may be accompanied by vomiting. It may be noticed, however, that it is usually excited by solid food or by hot fluids, that instead of being localized to the gastric region it is referred to the whole of the upper part of the abdomen, and careful inquiry will elicit the fact that it commences in the right hypochondrium and extends thence across the belly about the level of the navel. The pain is far more intense than that of gastric hyperæsthesia, is colicky in character, and the complaint is relieved by the

administration of suitable aperients and by the prohibition of fruits and green vegetables, provided the appendix is healthy.

Chronic gastritis, for which gastric hyperæsthesia is occasionally mistaken, is rare in young women unless they are the subjects of valvular disease of the heart, phthisis, chronic nephritis, or are addicted to alcohol. Actual pain after food is rarely complained of, but about an hour or more after meals a sensation of discomfort and fullness occurs, followed by flatulence, acidity, and nausea. Vomiting may occur in the early morning or after meals, and in both cases relieves the unpleasant symptoms which were previously present. The ejecta are largely mixed with mucus and usually deficient in hydrochloric acid. The appetite is diminished, loss of flesh is a prominent symptom, and the bowels are irregular rather than confined. Saline purgatives, combined with careful regulation of the diet and a course of alkalies and bismuth, usually relieve the complaint.

Treatment.—If any doubt exists whether a patient is suffering from ulcer or from hyperæsthesia it is wise to assume the presence of the more serious complaint, and to treat the case in accordance with this supposition. This line of practice is not only of value from the point of view of safety, but is in itself an important help in diagnosis, since the pain and vomiting due to ulcer invariably subside when the patient remains in bed and is confined to a milk diet, while in cases of hyperæsthesia the symptoms are usually aggravated by such measures.

If pain and vomiting are severe the patient should maintain a recumbent position for a few days, but confinement to bed for more than a week is rarely necessary. In recent cases cold compresses over the region of the stomach often help to relieve the symptoms, but in the chronic complaint a small blister should be applied to the skin of the epigas-

trium or the part be painted each night with the liniment of iodine.

Diet.—A milk diet often appears to increase the pain and it is, therefore, usually advisable to prescribe semi-solids rather than liquids. With this object lightly boiled or poached eggs, milk puddings, jellies, and clear soups are at first allowed, to be followed subsequently by white fish, chicken, game, rabbit, sweetbread, tripe, calf's head, with a little potato, cauliflower, or spinach. At a later period the patient resumes her ordinary diet.

The medicinal treatment of the complaint should be chiefly directed toward the cure of the anæmia or the correction of any other condition which may seem to have excited the complaint. When constipation has existed for some time, and especially if the colon is loaded with fæces, half an ounce or more of castor oil should be given each morning before breakfast, but if the patient cannot take the oil a full dose of the mistura alba or other saline may be substituted for it. Subsequently a daily action of the bowel should be secured by the administration of an iron and aloes pill night and morning after food or of some mild aperient each night, such as cascara and maltine, the confection of senna and sulphur, or the compound liquorice powder. For the treatment of the anæmia nothing is of greater value than the ammonio-citrate of iron, 10 to 15 grains of which may be combined with a drachm of the solution of bismuth and given three times a day after meals. These simple measures rarely, if ever, fail to produce an immediate improvement in all the aspects of the case, and should be continued until a cure seems to have been accomplished.

Gastric hyperæsthesia of secondary origin rarely requires separate treatment. If, however, its symptoms are severe and produce a deleterious effect upon the nutrition, it may be necessary to adopt certain remedial measures. In cases of organic disease of the brain and spinal cord a bismuth

mixture containing morphine, codeine, chloretone, or some other sedative usually affords most relief, while in neurasthenia and hysteria chief dependence should be placed upon the special treatment of these complaints. A pill containing one-quarter of a grain or more of nitrate of silver given twice a day before meals is often of value. This latter remedy is also recommended for the variety of gastric hyperæsthesia which ensues from tobacco poisoning (Rosenheim). Cessation of all medication, with the exception of a small dose of mercury and chalk each night, will soon relieve the form of the complaint which results from the abuse of drugs.

The fact that gastric hyperæsthesia frequently relapses should never be overlooked, and the patient must be warned to have recourse again to treatment immediately the symptoms show signs of recrudescence.

(2) GASTRIC NEURASTHENIA

(Nervous Dyspepsia)

This variety of dyspepsia is a combined form of neurosis which affects the sensory, motor, and secretory functions of the gastrointestinal tract.

Etiology.—According to Rosenthal, more than two-thirds of the cases are accompanied by neurasthenia, and Glax lays great stress upon the fact that symptoms of nervous dyspepsia almost invariably precede the manifestation of the general complaint. It may, therefore, be inferred that the predisposing causes of the disease are practically the same as those of general neurasthenia. Continued mental overstrain, frequent and severe forms of psychic excitement, shock, exhaustion from venereal or alcoholic excesses, self-abuse, spermatorrhœa, prolonged deprivation of food, and a protracted residence in hot climates are fruitful causes of the complaint among men ; while in women,

repeated child-birth, excessive leucorrhœa, anæmia, menorrhagia, and diseases of the uterus or its appendages are equally important factors in its production. The disease is common about the age of puberty and is very apt to develop when the body has undergone exceptionally rapid growth. In both sexes, but especially in boys, masturbation in early life is a common, though often unsuspected cause, while in girls, profuse and frequent menstruation sometimes appears to determine the onset of the complaint. Occasionally the first symptoms date from an injury, such as concussion of the brain or spine, the fracture of a long bone, or a severe shake in a carriage accident, and in a few instances they have been observed to follow immediately after a surgical operation. The convalescent period of certain infectious diseases is particularly apt to be complicated by gastric neurasthenia, more especially that of influenza, erysipelas, enteric fever, mumps, and malaria; while in rare instances an attack of gastroenteritis, induced by poisonous food or drugs, or even the administration of a drastic purge, has appeared to act as the exciting cause. Both sexes are equally prone to the disease, but it may usually be observed that men are most frequently affected before the age of thirty, while women are unduly susceptible to it between the ages of twenty and forty.

If one may judge from general statements, neurasthenia gastrica is more common in France and England than in other parts of Europe and is exceptionally frequent in America. It is also apt to attack certain families and is particularly rife among the Jews and the natives of India who come to this country for the purposes of study. According to my own experience, a close relationship exists between the gastric disorder and tuberculosis, and persons who have previously suffered from an attack of phthisis are unduly prone to fall victims to the nervous complaint. With regard to its incidence upon different classes of the

community somewhat contradictory opinions are entertained, but all writers are agreed that it is much more frequent among those whose occupations entail continual worry or excitement, such as stockbrokers, lawyers, teachers, artists, actors, and musicians, than in other spheres of life. My statistics show that gastric neurasthenia constituted 3 per cent. of the cases of dyspepsia that presented themselves for hospital treatment, and 13·2 per cent. of those met with in private practice.

Symptoms.—It is convenient to distinguish two clinical forms of gastric neurasthenia, according as the symptoms with which they are accompanied are mild or severe. In other varieties of indigestion such a classification would merely amount to a discussion of the early and late manifestations of the complaint, but in this particular disorder cases of a mild type continue to exhibit similar symptoms throughout their entire course, while those which belong to the severe form present serious phenomena from the outset and undergo little or no change until convalescence supervenes. It may be, of course, that the two types really depend upon different nervous lesions, but since their symptoms appear to differ only in degree, it is necessary to regard them as varieties of the same complaint.

(1) The Mild Form.—This variety is by far the more common and is characterized by an absence of the emaciation and cerebral depression that invariably accompany the severe form. In spite of their incessant and varied complaints, the subjects of this disorder rarely appear ill or anæmic, but on the contrary usually continue well-nourished and of healthy aspect. The appetite is subject to much variation, being sometimes irregular and capricious, at other times excessive, while occasionally complete anorexia may supervene. As a rule, the desire for food bears an intimate relation to the mental condition. Thus, if the patient be removed from his usual environment, be allowed

to mix in congenial society, or to pursue some form of amusement which enables him to forget for a time his worries and troubles, it will usually be observed that he is able to eat with relish and to digest articles of food which under ordinary circumstances would give rise to much discomfort. Conversely, anything that tends to depress the mind or add to his anxieties is at once followed by an exacerbation of the dyspeptic symptoms and perhaps by a complete failure of appetite. Another striking feature of the complaint is the absence of any direct connexion between the quantity or quality of the food and the severity of the subsequent indigestion. A large meal does not necessarily cause greater discomfort than a small one, and the same articles which one day give rise to the most wretched and protracted suffering may be taken on the next without any ill-effects. In many instances the patient always feels at his best immediately after a meal, and during the hour which succeeds the ingestion of food he is able to transact business with a clear head, to write, teach, or compose with facility and even brilliance. In other cases the symptoms of maldigestion ensue before he has left the table, and within a short time he will complain of an aching void in the region of the stomach which nothing but additional nourishment will satisfy. Weight, oppression, and distention are the terms most often employed to describe the sensations that ensue after meals, but occasionally severe attacks of pain, similar to those of gastralgia, are experienced. Constant belching constitutes an important symptom in many instances, but if the gas be collected and examined it is found to consist almost entirely of atmospheric air that has been swallowed with the food. Pyrosis, preceded by sharp pain at the base of the thorax, may recur at short intervals, but regurgitations of acid are never met with unless the disease is associated with hyperchlorhydria.

Nausea is a constant cause of complaint, but vomiting is exceptional. During an access of indigestion the face often flushes, the nose and ears burn, the head feels heavy, and the greatest disinclination is expressed to mental or physical exertion. In some attacks severe palpitation of the heart occurs, attended by shortness of breath, throbbing in the head, or a sense of impending dissolution. The tongue usually continues moist and clean, the urine is scanty and phosphatic, the pulse is small and feeble, and the temperature of the body is depressed.

Although the disease is regarded as an affection of the stomach, the functions of the intestines are also invariably disturbed. During the period of digestion the whole of the alimentary tract may become distended with gas, and the patient is much perturbed by loud rumbling noises in the abdomen which no effort upon his part is able to subdue. Constipation is an invariable feature, and often precedes the development of the gastric phenomena. It increases in severity as time goes on, and proves peculiarly intractable to ordinary methods of treatment. The stools consist of small round or oval masses of hard and dry fæces, coated with an opaque mucus, or present the appearance of long flat ribbons which may cause them to be mistaken for worms.

Burkart has described the existence of certain tender spots in the abdomen which he considers pathognomonic of nervous dyspepsia, deep pressure with the hand over the situation of the superior hypogastric, cœliac, and aortic plexuses, giving rise to a severe and characteristic attack of pain. Leven has also drawn attention to an abnormal sensibility of the solar plexus, which can apparently be detected by pressure over the median line of the abdomen immediately below the ensiform cartilage. There is no doubt that persons suffering from gastric neurasthenia frequently experience pain when sufficiently strong pressure

is made in one or other of these situations, but this phenomenon is by no means characteristic of the disease, nor is it by any means a constant feature (Bouveret, Ewald, Richter).

It was originally stated by Leube that nervous dyspepsia occurs independently of any perversion of secretion or motility, and that if the stomach is examined seven hours after a full meal it is invariably found to be empty. Since the publication of his memoir in 1879, the chemistry of digestion has been made the subject of much investigation, and both the methods employed by Leube and the results he obtained have been severely criticized by Stiller, Leyden, Glax, Bouveret, and other modern investigators. In fourteen cases of nervous dyspepsia carefully studied by Herzog, the motor power of the stomach was found to be enfeebled in nine and normal in five. Among the former series three presented a normal acidity, one subacidity, and five hyperchlorhydria, while in the latter the gastric secretion was normal in one instance and contained an excess of hydrochloric acid in the other four. It would thus appear that only one case out of the fourteen fulfilled Leube's definition of the disease.

(2) The Severe Form.—In this variety all the symptoms previously mentioned are exaggerated and the patient suffers from indigestion after every meal, whatever be its composition. Actual pain may exist, or vomiting may ensue at the height of digestion, and, as a rule, great complaint is made of a sense of coldness and vacuity in the abdomen which requires the further ingestion of food for its relief. But the chief features that distinguish this type of the disorder from the mild variety are steady emaciation and the profound constitutional disturbance that follows the administration of purgatives. Loss of flesh is a constant symptom, but it varies in degree in different cases and at different periods of the complaint. In elderly people the

average loss of weight per week may amount to a pound or more, and although the progress of emaciation often halts from time to time, an actual gain is rarely observed. This is especially noticeable since the patient usually consumes more food than he did when in good health. The skin also becomes dry and rough, the face thin and haggard, and in many instances a cachexia develops closely akin to that of carcinoma. In young individuals, on the other hand, a rapid loss of weight is often interrupted by periods of improvement, during which they recover the flesh and strength they had lost, without having altered the diet or lost the distressing symptoms of indigestion.

As a rule, constipation exists in a most intractable form, and, like that which accompanies the mild type of the complaint, is associated with the passage of hard, dry, attenuated or "rabbit-dung" stools, mixed with mucus. Occasionally, however, as Moebius has pointed out, the constipation may be replaced by a form of diarrhœa which occurs immediately after meals, and causes the elimination of the food before it has undergone digestion. In such cases the introduction of nourishment into the stomach seems to excite strong peristalsis of the whole of the alimentary tract, attended by griping pains in the abdomen and sometimes by nausea. The subjects of gastric neurasthenia can rarely tolerate aperients, and even enemata often give rise to the most depressing symptoms; indeed, it is a constant assertion that life is only tolerable so long as the bowels remain inactive. In every instance where an evacuation follows the use of an aperient, the patient is overcome by nausea, faintness, or exhaustion, and even when the medicine fails to act it may occasion the same distressing symptoms and necessitate confinement to bed for the day. Mental depression, closely allied to hypochondriasis, is frequently present, and the patient spends most of his time in consulting one doctor after another

under the firm conviction that he is suffering from some organic disease which nobody can diagnose.

The other symptoms that accompany severe gastric neurasthenia are less important but of the most varied description. In some instances the appetite is either entirely absent or is replaced by a loathing of food which is even more intense than that met with in cancer of the stomach or anorexia nervosa; while in others a canine hunger exists and the patient devours immense quantities of food at short intervals in order to ward off the nausea and faintness that ensue whenever the stomach becomes partially empty. Sometimes a spasmodic form of dysphagia makes its appearance, or a paresis of the cardiac orifice permits the frequent regurgitation of mouthfuls of acid chyme. Vomiting of the hysterical type is occasionally met with, and attacks of gastralgia are apt to occur from time to time and may simulate biliary colic or even perforation of the stomach. Both hyperchlorhydria and hypersecretion sometimes accompany the nervous disorder and give rise to the symptoms and signs characteristic of these conditions. In other instances, again, the patient constantly experiences unpleasant smells or a peculiar taste, or suffers from profuse salivation. Diarrhœa is a common symptom in some cases, and several actions of the bowel take place in rapid succession whenever the individual is excited or suffers from nervous apprehension. Another curious intestinal condition consists in the formation of localized contractions and isolated gaseous distentions of the cæcum or the flexures of the colon. Under these circumstances there is a sense of fullness and tenderness in the affected regions which disappears with a gurgling noise and the passage of flatus or of a thin, bile-stained fluid.

Some of the most severe and intractable cases I have encountered occurred in foreign Jewesses who had had their ovaries or uterus removed in early or middle life.

In such, every variety of solid food gave rise to violent pain and vomiting, and even peptonized milk could only be taken in small quantities; but notwithstanding this intolerance of food, loss of flesh proceeded very slowly and eventually a very fair degree of health was regained.

Cherchewsky has described a form of nervous ileus, the symptoms of which closely resemble those of internal strangulation; but after persisting for several hours they suddenly subside with the evacuation of a large quantity of gas. Neuralgic pains are extremely common, and usually affect the temporal, supraorbital, or intercostal nerves. Occasionally the whole of the spine becomes extremely tender and percussion over it gives rise to excessive pain or faintness. Attacks of palpitation, attended by a quick or irregular pulse, are apt to supervene after excitement or fatigue, and extreme breathlessness may occur under similar conditions. Vertigo is often complained of both when the stomach is empty and after a full meal, and may closely resemble the form that accompanies disease of the semicircular canals. Disinclination to exercise, both mental and physical, invariably exists, and the limbs are often described as heavy and cold or affected by sensations of burning, numbness, or formication. The sexual functions are depressed, and profound exhaustion is experienced after intercourse. Erections are of short duration, and emissions ensue rapidly and are apt to recur at short intervals without obvious cause. Finally, such cerebral symptoms as cephalalgia, strabismus, diplopia, insomnia, and paresis of the extremities are occasionally encountered and may occasion much anxiety.

The secretory and motor functions of the stomach are always seriously affected. During the whole period of digestion splashing sounds may be obtained below the level usually occupied by the viscus, and undigested food may be evacuated by a tube more than seven hours after a meal.

X-rays demonstrate stagnation in the stomach and colon.

The total acidity of the gastric contents may not exceed 15, and free hydrochloric acid is often absent. Absorption both from the stomach and intestines is much delayed, and it is probable that the secretions of the pancreas and bowel are either diminished or so altered in character that the carbohydrates and fats undergo little or no digestion in the body. In this connexion it is interesting to observe that Jürgens is said to have demonstrated degenerative changes in the plexuses of Meissner and Auerbach in the cases of nervous dyspepsia which he examined after death.

Complications.—When the severe form has existed for some time it is apt to become complicated by dilatation of the stomach, enteroptosis, and mucous colitis.

Gastrectasis is frequently met with at an advanced stage of the complaint and may develop in two ways. Most commonly it ensues as the result of simple myasthenia of the viscus and is due in all probability to defective innervation of the stomach. In other instances a deficiency of hydrochloric acid in the gastric secretion favours fermentation of the food, with the result that the mucous membrane becomes constantly irritated by the acid products of decomposition and the viscus becomes over-distended by the gases evolved during the process. This condition of muscular insufficiency is easily recognized by the fact that the stomach contains undigested food seven hours after a meal, and is probably responsible in part for the rapid emaciation that invariably ensues when this complication becomes established.

Enteroptosis is much more common in women than in men, being predisposed to by relaxation of the abdominal wall consequent upon repeated pregnancies. Neurasthenia probably increases the tendency to downward displacement of the viscera by the loss of abdominal fat and the increased

weight of the dilated stomach with which it is so often accompanied. The symptoms and signs of gastro-enteroptosis are discussed in detail in Chapter VI.

Mucous colitis is very apt to supervene in severe cases of nervous dyspepsia, but is chiefly met with in females. The fæces, deprived of moisture by their long retention in the large intestine, excite an inflammatory condition of the mucous membrane of the colon attended by a copious secretion of mucus. In the early morning the patient is awakened by attacks of colicky pain in the region of the cæcum or sigmoid flexure, which are sometimes followed by several small evacuations of mucus. At other times of the day, and more especially after meals, solid material is voided in the form of hard, rounded masses covered with mucus and sometimes stained with blood; while occasionally the motion consists entirely of long strings of slime or small pieces of the lining membrane of the large bowel. These symptoms may occur each day or they may appear in the form of short attacks which persist for several days and are accompanied by moderate pyrexia. In this latter variety the stools are frequent, composed almost entirely of blood and mucus, and their evacuation is accompanied by much tenesmus. The complaint is very difficult to cure and may persist for a long time after the other symptoms of the gastric disorder have subsided.

Prognosis.—It is usually possible to divide the course of the disease into three periods: The first, or period of aggravation, is characterized by the gradual increase of emaciation and the development of the various symptoms of disordered digestion; in the second, or stationary period, the patient ceases to lose weight, but the subjective phenomena undergo little change; while in the third, or convalescent stage, the weight of the body increases and improvement occurs in all the aspects of the case. As a rule, the disease lasts from eighteen months to two years, but it

may persist for three or even four years. The older the patient the more intractable does the complaint become, while in young persons recovery often takes place within a few months. Death occasionally occurs in the severe form from profound failure of nutrition aggravated by persistent insomnia, but not infrequently the fatal termination is attributable to tuberculosis or some other intercurrent complaint.

Diagnosis.—Gastric neurasthenia is not accompanied by any pathognomonic symptoms or physical signs, and it is therefore necessary to consider each case in its entirety before arriving at a diagnosis. Three points are, however, always worthy of special attention. In the first place, the gastric disorder is invariably accompanied by indications of general neurasthenia, and its symptoms vary both in their nature and severity according to the state of the nervous system. Secondly, the discomfort experienced after meals bears no relation to the quantity or quality of the food, since at one time the patient is able to digest with ease and comfort articles of diet which at another give rise to the most violent manifestations of dyspepsia. Thirdly, the results of analyses of the contents of the stomach performed at intervals vary almost as much as the symptoms; at one time the secretion of gastric juice being much depressed while at another evidences of hyperchlorhydria may be forthcoming.

Cancer of the stomach is the disease which is most frequently confounded with the severe form of the neurosis. This error of diagnosis is particularly apt to be made when the neoplasm pursues a latent course for several months and is unaccompanied either by tumour, hæmatemesis, or suppression of hydrochloric acid. As a rule, however, careful consideration will show that whereas the subject of gastric cancer has enjoyed excellent health prior to the onset of his present complaint, the nervous dyspeptic has suffered

for some time from symptoms of neurasthenia. In carcinoma the gastric phenomena steadily progress in spite of all treatment, the appetite fails, loss of flesh is severe and never alternates with periods of improvement, pain after food is persistent, while vomiting almost invariably occurs at some period of the complaint. The gastric secretion gradually diminishes, and lactic acid fermentation occurs in a large number of cases. Anæmia always accompanies carcinoma of the stomach, and the disease rarely lasts for more than eighteen months. On the other hand, even the most severe cases of gastric neurasthenia exhibit considerable variations in the severity of their symptoms; the appetite is often good and may be excessive; the process of emaciation is interrupted by periods of several weeks during which the patient may regain the weight previously lost; persistent pain and vomiting after meals are rarely encountered; the lips and conjunctivæ usually retain their normal colour; hæmatemesis never occurs, and lactic acid cannot be detected in the contents of the stomach. The nervous disease may last, with remissions, for several years, and is apt to recur should the patient suffer from another breakdown. X-rays often afford valuable confirmatory evidence of carcinoma.

Chronic gastritis differs in many important respects from neurasthenia gastrica. Vomiting is a frequent symptom both in the early morning and after meals, and the ejecta always contain an excess of mucus. The appetite is usually diminished, and is never excessive; emaciation is gradual; discomfort, flatulence, and acidity are constant phenomena and show little variation from day to day, and symptoms of neurasthenia are absent. The inflammatory disease can usually be traced either to abuse of alcohol, errors of diet, or to organic disease of some important organ of the body. Strict attention to diet with appropriate treatment produces a rapid improvement.

Ulcer of the stomach of the "dyspeptic" variety has occasionally been mistaken for nervous indigestion. In all obscure cases it is therefore wise, as Leube suggests, to try the effects of treatment for ten days before giving a definite diagnosis, since rest in bed and a milk diet usually remove the pain after food due to ulceration, while the symptoms of neurasthenia gastrica are often exaggerated rather than relieved by a similar treatment. It is also to be observed that chronic ulcer is usually attended by hypersecretion, while this disorder of secretion is infrequent in severe nervous dyspepsia and is apt to be replaced by subacidity.

The diagnosis of appendicular hypersecretion from gastric neurasthenia has already been discussed (Chapter II).

Treatment.—*General.*—The measures usually recommended for general neurasthenia are also indicated in cases of nervous dyspepsia. The patient must be encouraged to pursue a definite line of treatment, and constantly be reassured as to the non-existence of organic disease. In mild cases he may be directed to follow his usual vocation, provided it is not of too arduous a nature, to devote an adequate time to his meals, to go to bed at a reasonable hour, and to avoid adventitious forms of excitement and unnecessary fatigue.

Sexual intercourse is particularly harmful in many cases, and should always be restricted as far as possible. Change of air seldom fails to afford relief if care be taken to avoid humid and enervating localities. In most instances high altitudes are most beneficial, and a residence in Switzerland or in Scotland during the summer and autumn seldom fails to improve the appetite and to remove many of the symptoms of indigestion. When much physical enfeeblement exists a voyage to Australia is of greater value. As a rule, the southern and south-western parts of England do more harm than good, and many persons who endeavour to

regain their health by a holiday at Bournemouth, Torquay, the Isle of Wight or in Devonshire return home in a worse condition. Of the inland health resorts Malvern and Ilkley, in the north, and Hindhead, in the south, are the best, and there is seldom any objection to the east coast during the warmer months of the year. In every case the patient must be impressed with the fact that a complete rest is the main object of his enforced absence from home, and he should consequently free himself completely from business worries and remain away for at least two months. Short holidays are quite useless, and week-end visits only promote exhaustion. Owing to the important influence of environment, the patient should be surrounded by cheerful associates, and all news of a depressing or irritating character be withheld from him as far as possible.

In the severe form of the disease, accompanied by rapid wasting of the soft tissues, it is advisable to confine the patient to bed for a month or six weeks and to try the effects of a full milk diet combined with massage and, if necessary, electricity. The prohibition of literature and the visits of friends is usually harmful owing to the inherent tendency to melancholia, and in many cases where an effort is made to procure complete isolation, the patient throws off all restraint and refuses to subject himself any longer to the treatment.

In every instance the condition of the generative organs requires special attention, and careful inquiry should be made concerning self-abuse, spermatorrhœa, and venereal excesses, with the view of removing these potent causes of nervous exhaustion. Electricity is often of value both in relieving the gastric symptoms and in the treatment of the constipation. For the stomach a constant current of 3 to 5 milliampères is passed through the epigastric region for twenty minutes daily, the negative electrode being applied over the lower dorsal region and the positive one

immediately below the left costal margin. Einhorn and others prefer direct electrization of the organ by means of a metallic wire inserted into the ordinary stomach-tube, but the procedure is unpleasant to the patient and tedious of application. When electricity is employed for constipation, one pole is inserted into the rectum and the other, consisting of a large metal disc, is successively applied to the surface of the abdomen at different points along the course of the large intestine. The interrupted current is to be preferred to the constant one, and each sitting should last for about half an hour. This electrical treatment may be advantageously combined with massage of the colon, but the latter must be avoided when symptoms of mucous colitis exist. If anorexia is severe it may be necessary to resort to forcible feeding through a tube.

Diet.—The fact that the dyspepsia is only slightly influenced by the nature of the food renders it inexpedient to prescribe a strict dietary. As a rule, an excess of innutritious liquids, such as beef tea, broths, tea, and mineral waters, tends to distend the stomach and to increase the feeling of discomfort; while green vegetables and fruit almost invariably disagree and must, therefore, be avoided. The meals should be moderate in quantity, composed of materials that are easily digested, and should be taken at intervals of three hours. In the case of an excessive craving for nourishment between meals, egg and milk, a hard-boiled egg, or a cup of milk-cocoa may be allowed. The advisability of a pure milk diet must depend upon the state of the gastric secretion. In the mild form of the complaint, where the secretory and motor powers of the stomach are usually unaffected, five pints of warm milk a day, in divided doses, either with or without lime-water, form an excellent substitute for other forms of food, and usually promote the formation of fat and muscle. On the other hand, in the severe form of the disease a failure of the gastric secretion

renders an excess of raw milk very liable to disagree, and it should therefore be peptonized or well diluted before its administration. Sometimes Horlick's malted milk proves of use when the fresh form is inadmissible, or the patient may be persuaded to take one of the patent digested foods in preference to the ordinary forms of nourishment. Milk soured with lactobacilline is useful in many cases. In every instance mastication must be thoroughly performed, a sufficient time be allowed for each meal, and no exercise permitted for an hour afterward.

Medicinal.—The choice of drugs depends upon the state of the gastric secretion. When hyperchlorhydria accompanies the nervous disorder an alkaline mixture composed of bicarbonate of sodium, carbonate of bismuth, and glycerin may be given two hours after each meal, or a compound bismuth lozenge may be sucked at intervals during the course of digestion. As a rule, however, the severe form of the complaint is accompanied by a marked deficiency of gastric secretion, and it is in these cases that hydrochloric acid is of much value. In most instances it is sufficient to prescribe fifteen drops of the dilute acid after each meal, but sometimes a wineglassful of a 2 or 3 per 1,000 solution of hydrochloric acid at the end of each repast appears to be more beneficial. The various digestives, such as pepsin, pancreatin, lactopeptin, and papain, are rarely of any decided use, nor does the administration of takadiastase or maltine appear to influence the processes of digestion in any beneficial manner. Tablets of lactobacilline rarely possess any value. The treatment of the constipation is always a matter of great difficulty, owing to the exhaustion that follows the use of purgatives. In most cases a trial should be made in the first instance of a tablespoonful of glycerin each morning before breakfast, or of a small dose of mercury and chalk, cascara, or euonymin, combined with rhubarb and hyoscyamus, every evening after the last

meal. Saline aperients and natural aperient waters should always be avoided, as their employment invariably increases the general symptoms of distress. In severe cases reliance should be placed almost entirely upon enemata, soap and water or warm water containing glycerin or castor oil being employed for the purpose. Another useful method is the injection of warm olive oil into the bowel at atmospheric pressure. At first, half a pint may be given every alternate morning, but as the patient improves the injection need only be repeated every third or fourth day and the amount of the oil may gradually be diminished.

In all cases the general health should receive attention. If symptoms of hysteria exist a course of bromides combined with valerian often gives relief. Anæmia usually requires the exhibition of one of the bland preparations of iron, with which arsenic and nux vomica can be combined if necessary. In young persons cod-liver oil and the compound syrup of hypophosphites are often of great value in improving the state of the general nutrition.

(3) NERVOUS ERUCTATION

(Aerophagy)

Eructation of gas from the stomach occurs under many conditions. In healthy individuals a certain amount of air is usually swallowed with the food and is apt to be returned a short time after the repast; while the use of effervescent drinks and sparkling mineral waters is always followed by slight eructation of carbonic acid gas. Again, every form of indigestion is accompanied in a greater or lesser degree by the formation of gases in the stomach, and in many cases the chief symptoms of the complaint are due to the distention of the viscus by these products of fermentation. But in the disorder which is known as "nervous eructation" the only abnormal symptom consists

of a noisy belching, which comes on independently of food and may persist with occasional intermissions for weeks or months.

Etiology.—Nervous eructation is a comparatively rare complaint, and is chiefly encountered in neurasthenic and hysterical persons. It is far more common in women than in men, and usually develops between fourteen and twenty-five years of age. Two or more members of a family may suffer in the same manner and there can be little doubt that imitation often plays an important part in its causation. Occasionally men of middle age are attacked by it after a severe mental or physical shock, or it may develop at this period of life without obvious cause. The worst case that has ever come under my notice occurred in a barrister, who on account of the unpleasant and intractable nature of his disorder was obliged to give up his profession and to live in seclusion.

Symptoms.—The belching is caused by bubbles of gas, which ascend the œsophagus in rapid succession and burst in the pharynx with explosive force. As a rule, each eructation is accompanied by a double noise, the component parts of which are separated from one another by a slight but appreciable interval. The first is short, sharp, and metallic in character and is obviously caused by the bursting of the bubble of gas, while the second is much more prolonged and of a deeper tone and is due to secondary vibrations of the soft palate which cause an echo in the vault of the pharynx and in the mouth. The latter can easily be felt when a hand is placed upon the neck of the patient. The noise is repeated at irregular intervals, sometimes recurring two or three times a minute, while at others hardly a couple of seconds intervene between successive belchings. The eructation is not arrested by meals, although it usually ceases during sleep, and it may be brought on at any time by excitement, anger, fatigue, or even by

the visit of an unsympathetic friend. Occasionally pressure upon the throat, palpation of the epigastrium, or depression of the tongue with a spatula will provoke an attack. In a case recorded by Bouveret slight pressure upon the scar of a former burn was sufficient to induce a violent seizure. In most cases the complaint pursues an irregular course, the attacks lasting on each occasion for several days or weeks, and subsiding suddenly without obvious reason; but occasionally, and especially in men, the disease presents few or no intermissions and is practically incurable. In other respects the patients appear to enjoy excellent health, the appetite continues good, the nutrition is well maintained, and symptoms of dyspepsia are uniformly absent. In chronic cases, however, the wearisome and apparently hopeless nature of the complaint may induce melancholia with suicidal tendencies, and is often associated with progressive debility.

Etiology.—If the eructated gas be collected and measured it is astonishing how small an amount is found to be brought up on each occasion, while analysis shows that it is devoid of odour and is composed entirely of atmospheric air (Poengsen, Hoppe-Seyler). It, therefore, differs in a marked manner from the gas that is regurgitated in ordinary cases of flatulence, which is always considerable in quantity and consists of a mixture of nitrogen, carbon dioxide, and hydrogen, with a variable amount of marsh gas and other compounds.

Two explanations have been offered concerning the mechanism by which atmospheric air gains an entrance to the stomach. According to Oser, the stomach forms an elastic sac, the cavity of which is diminished by the contraction of the circular fibres of its muscular coat, but is augmented by the contraction of the longitudinal fibres. In this way the organ exerts an aspiratory effect, air being sucked into it by the one mechanism and expelled by the

other. On the other hand, Bouveret has shown that in many, if not in all, cases of nervous eructation, a clonic spasm of the pharynx exists which gives rise to the deglutition of air. According to this observer, with whose statements my own observations are in complete accord, not only can the clonic spasm of the pharynx be detected by the rhythmical movement of the larynx, but if auscultation be made over the stomach a bruit caused by the irruption of a bubble of gas into the viscus can be heard after each deglutition. As soon as the stomach becomes moderately distended in this manner, antiperistaltic movements of the organ set in, which have the effect of driving small quantities of gas through the patulous cardia into the œsophagus and thence into the pharynx. Occasionally, however, air cannot be heard to enter the stomach in the manner described, so it is probable that in some cases, at any rate, the bubble only penetrates a certain distance down the œsophagus before it is expelled by contractions of that tube. If a gag is inserted into the mouth or the tongue be held down, the clonic contractions of the pharynx are impeded or entirely prevented, and the eructations cease.

Treatment.—In hysterical females the complaint may usually be cured by general treatment and by appropriate suggestion. The exhibition of bromides, valerian, and iron is of much value, and the bowels should be maintained in regular action by suitable aperients. The most effective method of treatment in my experience consists of the passage of a full-sized tube into the stomach and its maintenance in that position for twenty minutes on each occasion. In more obstinate cases it may be necessary to administer a constant electrical current through the tube, and to apply repeated blisters to the epigastrium. When the disease develops in adults without obvious cause, its violence may be allayed by the insertion of a gag so as to keep the teeth apart, or an instrument to depress the tongue ;

but both these expedients are only of temporary value and the disease usually defies every effort to cure it.

(4) HABITUAL REGURGITATION

In this neurosis of the stomach food constantly regurgitates into the mouth during the course of digestion, and is either expectorated or swallowed again according to circumstances. The complaint is almost entirely confined to hysterical and neurotic persons, and affects both sexes. In many instances there is a history of excessive masturbation commencing at an early period of life, and in such the first symptoms usually occur about the age of puberty. In others the disorder appears to follow an attack of influenza or diphtheria or even acute pleurisy, while in not a few it is associated with some other nervous affection of the stomach or forms a prelude to an access of nervous vomiting. Occasionally the habit is induced in the first instance by pressure upon the epigastrium or a voluntary contraction of the abdominal muscles, the increase of intragastric pressure brought about in these ways being sufficient to express a portion of the chyme through the weak cardiac sphincter into the œsophagus. Subsequently the habit becomes involuntary and the patient is no longer able to control the regurgitation.

In a well-developed case the symptom commences within half an hour of a meal by the regurgitation of a small quantity of the gastric contents into the mouth every few minutes, preceded on each occasion by a slight expiratory effort with the glottis closed and a spasmodic contraction of the abdominal muscles. The material is always liquid in character, although it contains numerous particles of food and its taste varies according to the period of digestion, being insipid in the first instance but subsequently becoming more and more acid. In the latter condition the œsophagus is irritated by the gastric juice and a scalding sensation is

experienced behind the sternum with a sour taste in the mouth. Whenever it is possible the patient spits out the mouthful of food, and even when circumstances forbid this he never chews it again or swallows it with relish. This fact forms the main distinction between habitual regurgitation and rumination. The symptom gradually subsides as the stomach becomes empty, but recurs after each subsequent meal. It is rarely associated either with nausea or flatulence. Owing to the fact that only a small quantity of the ingesta is got rid of, the complaint produces no deleterious effect upon the general nutrition, and it is only in exceptional cases that it is severe enough to induce progressive loss of flesh. On the other hand, the constant annoyance which it involves renders the subjects of the complaint extremely depressed, nervous and irritable, and the disorder is not infrequently followed by hysteria, neurasthenia, nervous vomiting, or by neurasthenia gastrica. There is no evidence that it ever leads to genuine rumination.

The diagnosis of the disorder is extremely simple. The involuntary nature of the regurgitation, the non-existence of nausea, flatulence, and other symptoms of dyspepsia serve to distinguish it from ordinary pyrosis, while the fact that the food is mixed with gastric juice and only regurgitates after it has been swallowed for some time negatives the possibility of an œsophageal stricture. An œsophageal pouch also gives rise to the regurgitation of food, but in this condition the material contains no hydrochloric acid, is semi-solid rather than liquid, and often exhibits signs of putrefaction. The passage of a tube or X-ray examination will at once demonstrate the presence of a diverticulum.

Treatment.—This is usually disappointing. In every case the patient should be made to eat slowly, to masticate the food well, and to avoid any form of pressure upon the abdomen. Voluntary efforts to suppress the regurgitation

are always attended by a certain degree of success and should be encouraged as much as possible. The occasional swallowing of small pieces of ice is said to reduce the frequency of the regurgitation. The application of electricity, both internally and externally, should be tried, and strychnine and other remedies may be prescribed. A milk diet and daily massage often reduce the severity of the symptom, but when the patient returns to his ordinary mode of life it usually recurs.

CHAPTER VI

DYSPEPSIA DUE TO DISPLACEMENTS OF THE STOMACH

(Gastroptosis. Gastro-Coloptosis. Visceroptosis. Splanchnoptosis. Glénard's Disease)

Although downward displacement of the abdominal organs had been described by Morgagni in the eighteenth century, and certain pathological conditions resulting from it had received much attention from Virchow, it was not until the publication of Glénard's monograph upon Enteroptosis and Neurasthenia in 1886 that the subject attracted definite attention. Since that time numerous researches, greatly assisted by the adoption of X-ray examinations, have proved that moderate degrees of visceroptosis are extremely common, with the result that to-day there is a great tendency to regard an abnormal position of the stomach or colon as a substantive disease, the presence of which affords an adequate explanation of almost every obscure abdominal symptom; just as twenty years ago a "loose kidney" was endowed by many medical men with an equally important and promiscuous symptomatology.

Much confusion still exists in the nomenclature of the condition, some writers being wont to lay emphasis upon the displacement of special viscera by the employment of such terms as gastroptosis, enteroptosis, hepatosis, nephroptosis, etc., while others include all varieties under the more comprehensive designation of visceroptosis or splanchnoptosis. It is probable that the earlier predilection to individualiza-

tion was due to the fact that the position of the stomach and kidneys was much more easily recognized by the methods then in vogue than that of the intestine, with the result that the clinical symptoms exhibited by a case were referred to the organ which presented obvious displacement. While it cannot be denied that the stomach and right kidney sometimes suffer from ptosis or undue movability independent of more general visceroptosis, it is equally true that in the vast majority of the cases downward displacement of the stomach or kidney is associated with a similar condition of the right half of the colon, and much difficulty is experienced in distinguishing between the symptoms that arise from these various abnormalities. Systematic employment of the X-rays has shown that the most frequent visceral displacement involves the pylorus, which is accompanied in four-fifths of the cases by a descent of the hepatic flexure and in a considerable proportion by downward displacement and undue movability of the right kidney; and since this composite condition often displays a characteristic though complex clinical picture, it seems permissible to describe it by the term *Gastro-Coloptosis*. A general descent of the abdominal organs, including the stomach, intestines, kidneys, and to a lesser extent the liver and spleen, is a common result of stretching and attenuation of the parietes, and presents a series of symptoms and physical signs which are sufficiently distinct to merit separate consideration. This variety will therefore be described as *Splanchnoptosis*. Upward displacement of the stomach is merely a pathological curiosity and has little clinical importance. As, however, it is customary for writers to allude to this abnormality, a short description of its causation and symptomatology is appended as a preface to the more important varieties.

Anatomical Considerations.—The cardiac orifice of the stomach is situated one inch below the left wing of the

diaphragm on the level of the ninth dorsal spine, and corresponds in front with the seventh left costal cartilage, one inch distant from the sternum. The pylorus lies at a lower level and is nearer the surface. Posteriorly, it is on a level with the twelfth dorsal spine, while in front its position may be designated by the point of intersection of a line connecting the bony ends of the seventh ribs with one drawn parallel to and midway between the median line of

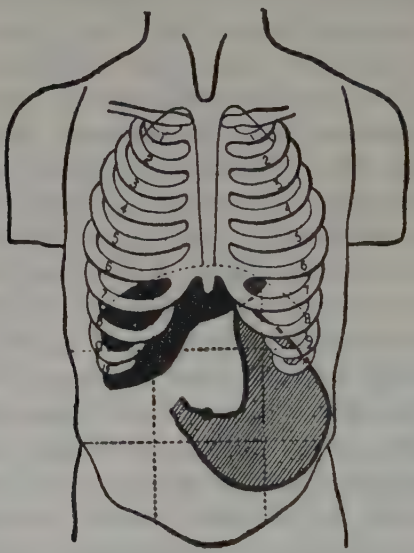

FIG. 1.—"Angular" displacement.

the sternum and the right border of that bone. The fundus reaches as high as the sixth chondro-sternal articulation on the left side, being a little above and behind the apex of the heart. The lesser curvature runs obliquely downward and to the right under cover of the liver, and corresponds posteriorly to the upper border of the first lumbar vertebra. The lower border is extremely variable in position, but when the stomach is empty it may be denoted roughly by a line drawn across the abdomen between the bony

extremities of the eighth ribs. The cardiac orifice is the most fixed part of the organ, being maintained in position by the œsophagus and the gastro-phrenic ligament. In addition to these attachments, the organ is suspended from the liver by the gastro-hepatic omentum, and is securely fixed on the left side by folds of peritoneum which connect it with the spleen. Below it rests upon a cushion of intestines and is supported in front by the liver and abdominal

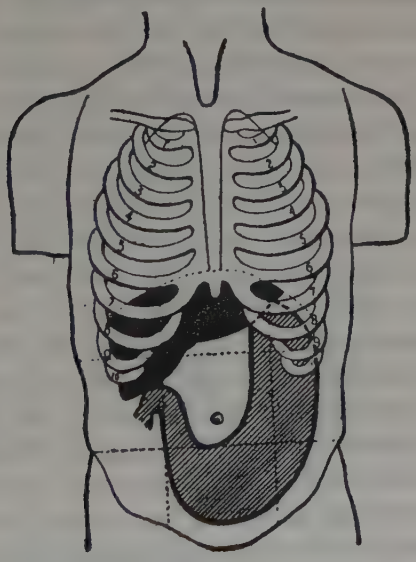

FIG. 2.—"Fish-hook" stomach.

wall. The pylorus is the most movable part of the viscus, and has no special ligaments, so that when displaced downward it is chiefly held in check by the second part of the duodenum which is firmly adherent to the posterior abdominal parietes. It is customary to describe three anatomical forms of displaced stomach, namely, the Angular, the Fish-hook and the Straight.

(*a*) In the *angular* form, which is by far the most common (Fig. 1), the pylorus is displaced downward, and is usually

situated in the median line of the abdomen just above the umbilicus. The lower half of the lesser curvature runs transversely across the abdomen below the anterior border of the liver, while the upper part is more vertical than usual. The fundus reaches the fifth or sixth interspace, but the main bulk of the stomach is located in the left hypochondrium and in the left side of the abdominal cavity.

(*b*) The *fish-hook* variety (Fig. 2) is less common but much more important than the preceding one. The pylorus maintains its normal position, but its orifice is directed upward. From this point the pyloric portion of the viscus runs vertically downward to the head of the pancreas, and lies parallel and contiguous to the second part of the duodenum. The lesser curvature lies below the liver and the left half of the pancreas. The cardiac pouch is often dilated, and the great curvature may extend to the right of the median line of the abdomen. The acute angle formed at the junction of the first and second parts of the duodenum causes the stomach to act at a disadvantage, with the result that dilatation of the viscus often ensues, while its muscular insufficiency becomes further increased by the drag of the enlarged organ upon the fixed part of the duodenum.

(*c*) The *straight* variety (Fig. 3) is rare. In this form the pylorus is situated at or below the level of the umbilicus, and its changes of position are accompanied by much stretching of the duodeno-hepatic ligament. The stomach becomes elongated and its diameter diminished, while its long axis tends to assume a vertical direction. The liver is rotated backward, and is often laterally compressed; the right kidney is loose, the spleen is depressed and deformed, and not infrequently the other abdominal viscera undergo a downward dislocation.

The *cæcum* varies considerably both in shape and position, the latter being determined in the normal subject by the length of its mesentery. An extreme degree of

mobility permits it to drop into the true pelvis or to be dragged by peritoneal adhesions to different parts of the abdomen, while a developmental arrest of its natural descent from the right hypochondrium to the iliac fossa is sometimes responsible for its location in the right lumbar region or immediately beneath the liver.

The *ascending colon* has to propel its contents against the force of gravity and consequently requires adequate support

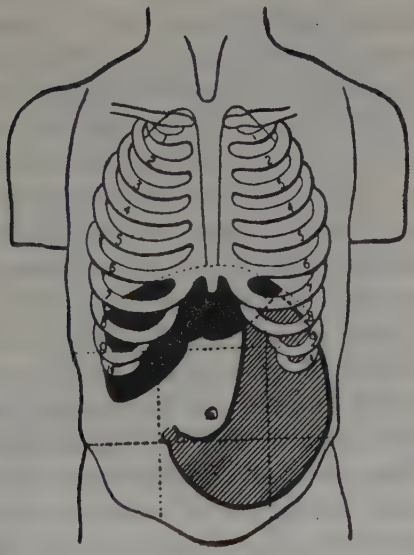

FIG. 3.—" Straight " vertical displacement.

from the tissues that surround it. For this purpose the peritoneum is usually closely applied to its anterior and external surface, so as to bind it against the posterior wall of the abdomen. In about 26 per cent. of all subjects, however, its primitive mesentery persists in a more or less marked degree and thus deprives it of the important and necessary attributes pertaining to a fixed tube. Its upper rectangular bend, or hepatic flexure, lies behind the right

lobe of the liver; but since it is not provided with any strong sustentacular ligament it is extremely apt to sag if unsupported from below, with the result that the ascending colon becomes shortened, pouched or folded upon itself like a deflated concertina, with infolding of the cæcum if that organ remains in the iliac fossa.

The *transverse colon* is suspended across the abdomen by its mesentery, the width of which varies from the normal eleven centimetres to twenty or more. The greater the width of the meso-colon the lower will the bowel lie in the abdomen, so that in exaggerated cases the transverse colon dips into the pelvis at its centre and the large intestine resembles the letter M; or, if the hepatic flexure is abnormally low, the transverse colon slants obliquely upward from the right loin to the left hypochondrium where the splenic flexure is firmly attached to the diaphragm by the costo-colic ligament. The shape and position of the ascending and transverse portions of the colon consequently present very wide variations, and should secondary inflammations of the gut give rise to adhesions, the various parts may become adherent to one another with the production of kinking and ulceration of the mucous membrane.

The right *kidney* lies half an inch lower than the left and is enveloped and supported by a kind of capsule of fat-bearing connective tissue derived from the parietal layer of the subperitoneal fascia. The adipose element varies greatly in quantity: when it is abundant, the kidney is comparatively fixed, while diminution of the fat renders the organ unduly movable. The true "floating kidney," with which a "loose" or unduly "movable" kidney is so often confounded, is a rare congenital condition and depends upon its entire investment by peritoneum, which gives rise to a distinct mesentery and permits the organ to be moved about the abdomen. A rotary twist of this pedicle produces the distinctive phenomena known as the

crises of Dietl. When the cæcum is prolapsed the right kidney may be adherent to it.

Adventitious peritoneal bands are often encountered in cases where the mesenteries are abnormally long. One of the most common is a membranous sheet, sometimes designated Jackson's membrane, which connects the outer edge of the cæcum and ascending colon with the abdominal

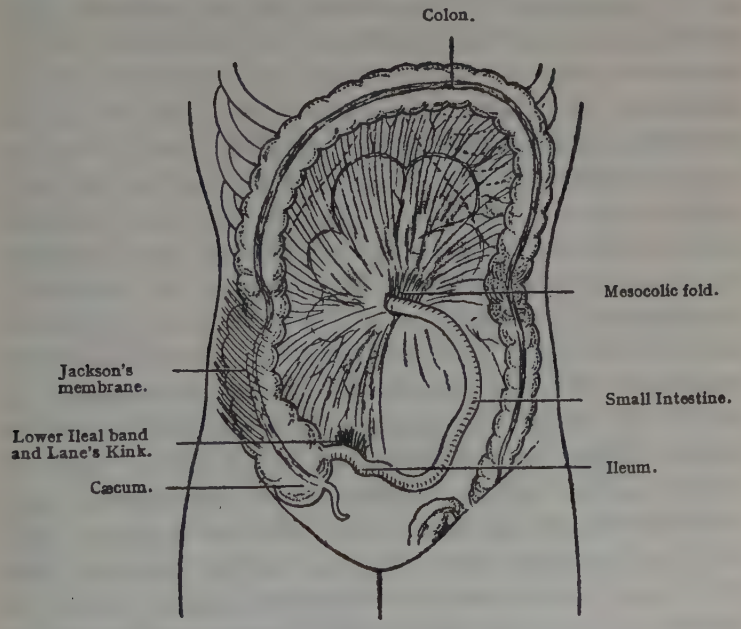

FIG. 4.—Diagram showing Adventitious Bands and Membranes.

wall on the right side and perhaps with the liver. The kink described by Lane is due to a band that sometimes ties the lower extremity of the ileum to the posterior parietes; while kinking of the upper end of the jejunum may occasionally ensue from the existence of a membrane that unites this part of the intestine with the transverse mesocolon (mesocolic fold). These adventitious bands are often found in persons who have not exhibited any particular

symptoms during life, and any effects which they produce are probably caused by kinking of the gut from the drag of the sagging bowel upon these points of fixation.

(1) UPWARD DISPLACEMENT OF THE STOMACH

This can only occur on the left side, since on the other the firm and fixed liver is interposed between the organ and the diaphragm. It is met with in all conditions that tend to shorten the vertical diameter of the thorax, and is therefore a common result of the atelectasis that ensues from a left pleuritic effusion or empyema, and of chronic interstitial inflammation of the left lung. Large ovarian tumours, uterine fibroids, hydronephrosis on the left side, meteorismus, and ascites all tend to push the stomach into the left concavity of the diaphragm, and the same condition ensues during the later months of pregnancy. An important predisposing cause of this form of displacement is to be found in that maldevelopment of the thorax which gives rise to an abnormally narrow costal arch. In cases of this description, the pressure exercised by corsets or tight clothes tends to force the lower four or five ribs inward, and to depress the line of the waist until it may reach the level of the iliac crests, while at the same time the colon, stomach, and liver are pushed upward. The effect upon the stomach of upward dislocation varies in different cases, in some the total capacity of the organ being reduced, while in others the pyloric portion becomes diminished in size and the fundus dilated. Occasionally the cardiac region is pushed upward so forcibly that the lower end of the œsophagus is bent to the left and the lumen of the fundus is greatly reduced. In cases of traumatic rupture of the left wing of the diaphragm the whole or greater portion of the stomach may gain entrance to the left pleural cavity.

Symptoms.—Upward displacement of the stomach is

rarely accompanied by special symptoms unless the degree of dislocation is considerable. In most instances discomfort and fullness are experienced after meals, attended perhaps by nausea, flatulence, and palpitation. In more pronounced cases the torsion of the œsophagus and compression of the fundus prevent eructation of gas and vomiting, so that the feeling of oppression after food is greatly exaggerated, and the patient is unable to assume a recumbent posture without experiencing an alarming sense of suffocation. Upward displacement of a distended fundus is apt to induce paroxysmal attacks of dyspnœa and palpitation during the period of gastric digestion, accompanied by giddiness, cyanosis, præcordial pain, and great irregularity of the pulse. These symptoms are always most severe after the evening meal, and in cases of weak or diseased heart are apt to occasion severe or even fatal syncope. When the displacement arises from narrowing of the thorax and the creation of a low and long waist, the hepatic and splenic flexures of the colon are forced inward and backward, and the transverse portion of the bowel is not infrequently bent into the form of a V with the apex pointing toward and reaching within a few inches of the pubes. These changes in the position of the colon are productive of muscular insufficiency and encourage stagnation and fermentation of its contents, which in their turn may lead to chronic colitis.

Physical Signs.—Artificial inflation of the stomach shows that the fundus reaches an abnormally high level in the chest and causes displacement of the apex of the heart to the right. Splashing sounds are obtained with difficulty, and the great curvature may lie so much above its usual position as to create an impression that the organ is unduly small. An X-ray bismuth examination will at once demonstrate the size and location of the viscus.

Treatment.—Care must be taken to correct as far as possible the conditions which are responsible for the abnor-

mal position of the stomach. In the case of abdominal tumours or ascites, the removal of the growth or the fluid is at once followed by a descent of the organ, while in cases of meteorismus the exhibition of suitable aperients, the prohibition of green vegetables and fruit and a course of intestinal antiseptics, are usually followed by improvement. When the distention results from chronic intestinal obstruction, the patient should be given a dose of castor oil each morning before breakfast, pending the performance of an operation. In those cases where the malposition depends upon an abnormal shape of the thorax, the wearing of tight corsets and of strings round the waist should be avoided as far as possible, and the patient should be taught some form of breathing exercise that helps to augment the capacity of the chest. Gymnastic exercises which promote the muscular development of the thorax and trunk are also of benefit.

Starch and sugars should only be allowed in moderation, and care should be taken to avoid any excess of fluid with the meals. Effervescent drinks are almost always harmful. Green vegetables should be taken sparingly, and the food must be thoroughly masticated. A dose of cascara, combined with euonymin and rhubarb, forms an excellent corrective of the constipation, but salines should be given with caution. When much respiratory or cardiac distress is experienced after meals, a carminative and antispasmodic mixture may be prescribed; and, in the event of a severe attack, the patient should pass a soft tube into the stomach with the view of evacuating the gas which cannot escape through the displaced œsophagus. Intestinal fermentation may be corrected by means of cyllin, dimol, guaiacol, or salicylate of bismuth taken after meals.

(2) GASTRO-COLOPTOSIS

This term implies a descent of the stomach and of the right half of the colon. Either condition may occur in-

dependently of the other, but they are associated in more than 80 per cent. of the congenital examples of visceroptosis, and in 20 per cent. are accompanied by moderate downward displacement and increased movability of the right kidney.

Frequency.—It is difficult to state with any degree of accuracy the frequency with which this condition is encountered, since most of the recorded observations were undertaken by methods which only demonstrated the position of the stomach and kidneys, while X-ray examinations have not yet provided sufficient data regarding the involvement of the colon. Glénard estimated that enteroptosis existed in about 11 per cent. of the population; Bassler noted its existence in 26 per cent. of the subjects he examined, and Meinhert found the displacement in 80 per cent. of the women and in 5 per cent. of the men who came under his notice. This observer also noted gastroptosis in nearly 50 per cent. of girls at twelve years of age. Among patients suffering from diseases other than those affecting the digestive organs, I found gastroptosis in 6 per cent. of the males and in 33 per cent. of the females.

With regard to the frequency of gastroptosis among persons who suffer from disorders of digestion, Einhorn detected its existence in 6·2 per cent. of his male and in 34·8 per cent. of his female patients. Out of 500 consecutive cases which came under my care in hospital practice, the digestive disturbance appeared to be dependent upon gastroptosis in 3 per cent.; while in a similar series occurring in private practice, the percentage was 17·6. In both classes the ratio of females to males was about 4 to 1. It is, therefore, probable that in about 10 per cent. of all cases of functional disturbances of the digestion the symptoms depend in the first instance upon downward displacement of the stomach or bowel.

Causation.—It is a common belief that the various forms of visceroptosis develop during adult life as a result of

some functional disorder of the digestive organs. This view is no more tenable than that which formerly attributed gastroptosis to tight lacing, and not only fails to explain why a descent of the stomach, and often of the colon, is demonstrable in nearly fifty per cent. of all female children, but also the comparative infrequency of the condition among males. While it is true that slight degrees of vis-

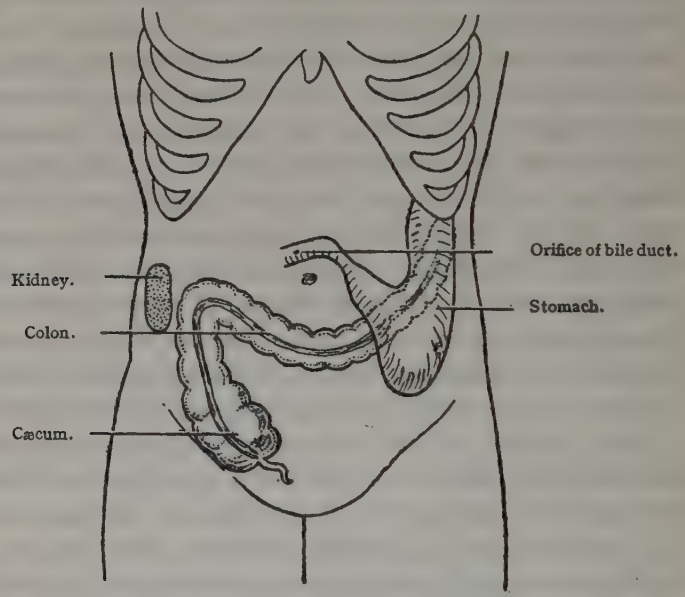

FIG. 5.—Diagram of Gastro-Coloptosis.

ceroptosis invariably become exaggerated as life proceeds and are increased by any condition that deleteriously affects the general health of the individual or directly augments the downward descent of the abdominal organs, it is equally certain that *in the great majority of the cases an abnormal position of the stomach and colon is due to some congenital defect of their suspension or attachments.*

Congenital anomalies which induce or actively predispose

to visceroptosis in adult life are often to be found in an exceptional length or undue tenuity of the peritoneal folds that support the stomach and colon. In many instances, an abnormal width of the gastro-hepatic omentum or transverse mesocolon causes these organs to be suspended at a lower level of the abdomen than usual, while in others persistence of the primitive mesentery of the ascending colon deprives that portion of the bowel of its necessary support and permits of a descent of the hepatic flexure. The effect of the constant drag upon the stomach and bowel in the erect posture of the body is always intensified by structural defects of the ligaments that hold these organs in place, and any extra strain is liable to stretch and even to lacerate such structures when they are abnormally thin or friable. A reversion to the embryonic condition, whereby the stomach maintains the vertical position it occupies in the fœtus, was held by Kussmaul to be responsible for the subvertical organ met with in adult life; and although this view has been opposed by later writers it is undoubtedly true in respect of many cases of gastroptosis. The effects of an arrested descent of the cæcum are less obvious, as also is the significance of the floating tenth rib, which according to Stiller is frequently found in conjunction with these congenital abnormalities. A long, narrow, rigid chest with a contracted funnel-shaped lower aperture is almost always associated with descent of the stomach and colon, and a mere glance at such a thorax is sufficient to indicate the probability of visceroptosis. This variety of chest is exceptionally common in families which exhibit undue liability to pulmonary tuberculosis, and not only helps to explain the development of indigestion in successive members of a family after puberty, but also the origin of what was formerly known as "the premonitory dyspepsia of phthisis." In addition to the limited accommodation afforded to the fundus of the stomach and the liver

by the narrow thoracic outlet, it is probable that this malformation of the thorax disturbs the equipoise of the thoracic and abdominal groups of respiratory muscles, which is considered by Keith to be such an important element in the production of visceroptosis. Lastly, congenital malformation of other organs is often associated with visceroptosis. Thus, some of the most troublesome clinical cases are met with in women who possess the infantile type of uterus; while gastro-coloptosis is an invariable accompaniment of congenital stenosis of the mitral and tricuspid valves. It is also met with in transposition of the colon, where the cæcum occupies the left iliac fossa. The effects of adventitious bands and membranes have already been mentioned.

Many conditions that develop after puberty tend to *increase* a pre-existent gastro-coloptosis, but whether, with perhaps a few exceptions, they are capable of inaugurating the visceroptosis is extremely doubtful. (1) Chapotot and other French writers have laid great stress upon the detrimental use of tight corsets and have attempted to prove that constriction of the lower thorax in early life prevents adequate development of the upper diameters of the abdominal cavity and is the principal cause of gastroptosis. There is, of course, no doubt that the old-fashioned corset was capable of exerting injurious pressure upon the liver and thus of increasing any natural tendency to visceral ptosis; but since the same abnormalities are found among native races who have never worn constricting clothing, and also in girls less than twelve years of age, while the general adoption of the straight-fronted corset has not materially diminished the frequency of the condition, it is obvious that such forms of external pressure are rarely the exciting cause of visceroptosis. (2) All enlargements of the liver tend to press the stomach downward and inward, and should the spleen also be increased in size the stomach

becomes squeezed between the two solid organs, and not only assumes a vertical position but may be so diminished in transverse diameter as to resemble a piece of large intestine (Kussmaul, Bouveret). (3) Extensive emphysema of the lungs, especially when associated with curvature of the dorsal spine, gives rise to flattening of the diaphragm and downward displacement of the abdominal viscera which lie in contact with it. In like manner, a pleuritic effusion or pneumothorax affecting the left side of the chest produces a temporary dislocation of the stomach and left lobe of the liver. (4) Stretching and attenuation of the abdominal parietes, accompanied by a diminution of intra-abdominal pressure, invariably accentuate any tendency to visceroptosis, the symptoms and signs of which consequently become much more prominent after parturition, the removal of a large tumour or even fluid from the abdomen. Rapid loss of subperitoneal fat acts in a similar manner, but in this case the right kidney is more affected than the stomach or colon. (5) The subjects of gastro-coloptosis are often injuriously affected by an attack of a specific febrile complaint, such as influenza, measles, typhoid or pneumonia, the previous symptoms becoming markedly exaggerated during convalescence. In these cases, the stomach is more affected than the colon, owing probably to excessive administration of fluid nourishment, which not only increases the displacement of the organ but causes further enfeeblement of its muscular structure. (6) Congenital gastro-coloptosis is invariably and closely associated with that complex series of nervous phenomena termed "general neurasthenia," and whenever this phase of the disorder becomes predominant, increased ptosis of the stomach, right kidney and perhaps of the colon may be demonstrated by the X-rays. This, however, is sometimes more apparent than real, and in the case of the kidney depends upon the loss of fat that invariably accompanies the complaint,

while progressive gastroptosis is usually due to concomitant myasthenia gastrica attended by secondary gastritis. (7) Removal of the ovaries in young women, and even an exploratory laparotomy, is often followed not only by an increase of the nervous and digestive symptoms but also by a further descent of the viscera. (8) Enlargements of the stomach and colon augment the drag upon their attachments and consequently their descent in the abdomen. In almost every case of gastroptosis, the organ suffers from myasthenia and secondary inflammation of its mucous membrane, and the gastrectasis thus induced gives rise to traction upon the fixed duodenal point and further increases both the dilatation and descent of the viscus. In the case of the colon, fæcal accumulation is apt to occur as the result of constipation, and the retained fæces weigh the transverse portion downward and excite secondary colitis and not infrequently ulceration. (9) Peritoneal adhesions drag the intestines in many directions and produce kinking and ulceration. In like manner inflammatory shortening of the great omentum may produce much traction upon the stomach and torsion of its lumen.

Symptoms.—Congenital displacement of the abdominal viscera is not a disease: it is a condition which is often associated with an exceedingly complex symptomatology due to disturbance of the nervous and digestive systems. Many congenital deformities of the body are accompanied by peculiar aberrations of character and temperament, which sometimes develop into genuine mental disease under the influence of comparatively slight forms of provocation, and it is, therefore, not unreasonable to assume that the subjects of congenital deformities of the stomach and bowel possess an undue liability to functional derangements, which may manifest themselves from the operation of causes that in normal individuals would exert little or no effect. All disorders of the central nervous system

profoundly influence the secretory and motor powers of the stomach and bowel, which by the inanition they produce tend further to increase the original nervous complaint. In this manner a vicious circle becomes established, in which cause is followed by effect, and effect by augmentation of the cause, until it is extremely difficult to differentiate between primary and secondary phenomena. It is, therefore, hardly surprising that many neurasthenic dyspeptics, who owe the origin of their misfortunes to congenital anomalies of their abdominal viscera, present one of the most complicated and intractable disorders which the medical practitioner is called upon to treat.

In a considerable proportion of the cases gastro-coloptosis is not accompanied by any special symptoms. This latency is particularly common among men, and Bial has estimated that only one-half of the male subjects of gastroptosis suffer any inconvenience from it.

Women, on the other hand, of whom 33 per cent. exhibit some degree of visceroptosis, are much more liable to its deleterious effects, owing to the fact that they are unduly exposed to those factors which tend to excite an active symptomatology, such as menorrhagia, parturition and various emotional disturbances. The special features of the complaint rarely attain any degree of importance until eighteen to twenty-three years of age, unless an attack of appendicitis or childbirth has occurred. As a rule, the nervous phenomena precede those referable to the digestive system, and not infrequently migrainous headache immediately prior to the catamenial periods constitutes the premonitory symptom in the female, while in the male obstinate constipation is usually observed. When a well-established case is seen for the first time inquiry reveals such an extraordinary medley of symptoms that a systematic classification appears impossible, while the kaleidoscopic changes that occur in the clinical picture from day to day

render it extremely difficult to discriminate between the primary disorder and its numerous sequelæ. Complicated, however, as these cases appear, certain phenomena may usually be detected which indicate that a congenital dislocation of the viscera is the primary condition. In the first place, there is no disorder outside the realms of insanity which presents such a multitude of subjective symptoms at once obtrusive yet indefinite, avowedly constant yet evanescent, strictly localized at one moment yet widely diffused the next, and apparently curable by methods of treatment, which after a short time seem to aggravate rather than relieve. Secondly, the patient is always extremely susceptible to psychical impressions of every description, and immediately suffers from a recrudescence of her former troubles if subjected to slight mental or physical strain, or to a trivial injury. Thirdly, there exists a degree of general debility and a facial expression of illness for which the most searching examination fails to detect adequate cause; while the effort of walking or even standing erect may induce a sense of sinking or dragging in the hypogastrium or loins so exhausting in character as to confine the patient to her bed or couch. Lastly, all these various symptoms are greatly relieved by complete rest in the recumbent posture or by the application of a comfortable belt which affords support to the abdominal viscera.

A careful study of some four thousand cases of visceroptosis has convinced me that, in spite of the great variety and complexity of the symptoms with which the condition is often associated, there exists a great tendency for certain phenomena to group themselves together and to constitute the predominant features of the disorder throughout its entire course. In about seventy-three per cent. various indications of indigestion, accompanied by abdominal pain, flatulence and inanition, are the principal causes of

complaint, while in rather more than twenty per cent. severe periodic headaches, almost identical with those of migraine, overshadow all other symptoms. These two clinical varieties are therefore sufficiently distinct to merit separate attention.

(1) THE ABDOMINAL OR DYSPEPTIC VARIETY

The symptoms of this variety, which is met with in both sexes, rarely commence before eighteen years of age, unless their onset is precipitated by a severe physical or nervous shock, a febrile illness, pregnancy or acute appendicitis. At first they only occur at intervals, especially during the spring and autumn months, and after lasting a few weeks entirely subside; but with the progress of time, the attacks recur at shorter intervals until the disorder is practically constant. On rising from bed in the morning the patient feels exhausted and depressed, and suffers from flatulence, giddiness or faintness, and not infrequently from retching, which causes the expulsion of a little bile-stained mucus from the stomach. The ingestion of food produces pain in the epigastrium and chest after the lapse of about one hour, followed by a sense of abdominal exhaustion or "sinking" which induces a false appetite. Occasionally pain of a gripping or constrictive character is felt in the throat or cervical spine, while at other times palpitation of the heart, tachycardia, excessive yawning or an inspiratory form of dyspnœa cause much additional distress, and when they occur during the night give rise to hysterical panics. Vomiting is rare, unless voluntarily provoked, and the act of emesis is attended by much difficulty and straining, possibly on account of the stretched and elongated condition of the cardiac end of the stomach. For a similar reason, these cases seldom suffer from train or sea sickness.

It has been stated that hæmatemesis occurs in one half

of all cases of visceroptosis affected with indigestion, but the clinical observations from which such a conclusion was derived must surely have been very few in number or of an exceptional character. Out of my four thousand cases of which mention has been made, genuine hæmatemesis only occurred in 14 per cent. In these cases gastric hypersecretion invariably existed, and the bleeding was due, as in other varieties of the functional complaint, to multiple erosions of the stomach (p. 83). The hæmorrhage is often preceded by severe pain after all kinds of food, and usually takes the form of coffee-ground vomit; but occasionally bright blood is vomited at intervals. In two cases it was sufficiently frequent and severe to warrant opening the stomach and treating the bleeding points with the cautery. True melæna is extremely rare, and whenever the hæmorrhage is excessive, ulcer of the stomach or duodenum invariably exists.

Constipation is almost invariable, and the stools are often hard, fetid and coated with mucus, or resemble rabbit's dung. The act of defæcation is sometimes followed by pain in the rectum or by intolerable itching of the anus. The skin of the body is dry, the hands and feet cold and clammy, and often bluish in colour; the temperature is depressed and the blood pressure below the normal. Abstention from food by reason of anorexia or the fear of indigestion induces a gradual loss of weight and strength, whereby both the nervous and digestive symptoms become intensified and a further descent of the stomach and colon is favoured. At an early stage of the complaint, the right kidney may usually be palpated to the extent of its lower half; but when the patient has lost more than eight pounds in weight the organ becomes more movable and defined until the entire viscus can be grasped between the hands. Conversely, when general improvement sets in and the body weight is regained, the kidney returns to its former position and does

not present the same degree of excursion on inspiration or bimanual pressure. In all these cases examination of the gastric contents after a test-breakfast demonstrates the existence of mild hypersecretion associated with a slight excess of free hydrochloric acid, and the X-rays show an abnormally active peristalsis of the stomach and duodenum, with stagnation of fæces in the transverse and descending portions of the colon. These conditions exist in about 53 per cent. of all cases of congenital gastro-coloptosis which suffer from indigestion at the commencement of the complaint, and with the exception of the symptoms of neurasthenia with which they are always accompanied, do not differ materially from other varieties of hypersecretion. Sooner or later, however, the symptoms characteristic of excessive gastric secretion become replaced by those of *chronic gastritis*, associated with hyperæsthesia of the gastric mucous membrane.

As a rule, this develops in an insidious manner and results from irritation of the hyperacid juice combined with intermittent pylorospasm; but there is also a distinctive and peculiar class of case in which chronic gastritis constitutes the predominant feature throughout the entire course of the complaint and owes its origin to retention of food brought about by flexion and kinking of the duodenum from the drag of the enlarged and dislocated stomach. Women are the chief subjects of this disease, and a mere glance at the patient is often sufficient to suggest the origin and nature of her illness. The face is thin, pinched and anxious-looking; the complexion sallow, with cyanotic patches over the malar bones, and the nose, lips, and ears are thickened and of a blue or violet colour. The hard palate is unduly high, arched and narrow, and the upper jaw boat-shaped, with somewhat projecting teeth, so that the mouth closely resembles that of a rabbit. The hands and feet are cold and blue even in the warmest weather, and the patient

never feels warm and usually suffers severely from chilblains in the winter. The chest is long, flattened and narrow, with a contracted lower outlet. The shoulders are bent, the lumbar curve obliterated, and the breathing approximates closely to the abdominal type. The liver projects about one inch below the costal margin in the erect position, and the left lobe is palpable and tender in the epigastrium. An X-ray examination indicates a vertical or subvertical stomach, with some dilatation and food retention and stagnation of the contents of the prolapsed colon; while the analysis of a test-breakfast demonstrates an excess of mucus with subacidity, and an absence of free hydrochloric acid.

Amenorrhœa or extreme irregularity of the catamenia is almost invariable, and in some of the worst cases either the ovaries have been removed at an early age or the uterus has preserved its infantile character. After a period of progressive emaciation, the weight of the body tends to maintain an equilibrium between five and seven stone, and all attempts to improve the nutrition not only fail but usually increase the digestive discomfort. In addition to the usual complaint of fullness, distention, flatulence, nausea, vomiting and complete absence of any desire for food, two symptoms often arrest attention. The first ie *severe pain* experienced immediately after the ingestion of any kind of solid food and even cold milk. In these cases, bread and butter, toast, and cooked meats seem to provoke the greatest degree of suffering, and occasionally chicken induces a veritable crisis. Violent retching, which causes the expulsion of a little gas and saliva, may ensue after each meal, but more commonly precordial pressure, with irregularity of the heart's action, inspiratory dyspnœa and a sense of impending death result from every attempt to digest even the most carefully prepared and selected foods. The second symptom worthy of special notice is

the *deleterious effects of purgatives* prescribed for the obstinate constipation, an action of the bowels being followed by a physical collapse which may necessitate confinement to bed for several hours. Enemata, carefully administered, are less injurious, but it is a common assertion of the patient that she is only happy when the bowels fail to act. The severe epigastric pain, which appears to be due to hyperæsthesia of the inflamed inner surface of the stomach, is too often regarded as an indication of ulcer, and many cases are submitted to operation for the cure of this supposititious disease. Removal of the appendix, which is usually diseased or represented by a fibrous cord, does not materially improve the digestion, while the performance of gastro-jejunostomy is disastrous, in that it is usually followed by persistent regurgitation of bile into the stomach, which aggravates all the former symptoms and renders life almost unendurable.[1] Such cases become human derelicts and spend the rest of their existence in seeking relief from the perpetual flatulence, nausea, anorexia, and vertigo with which they are afflicted, while many eventually lose their lives from an operation undertaken at their own demand for the closure of the artificial opening.

In about fifteen per cent. of the entire number, the descent of the stomach and colon is associated during adult life with *subacidity* rather than an increase of the gastric secretion, so that after a test-breakfast free hydrochloric acid is found to be absent and the combined acid much diminished in amount. In these cases chlorosis often develops about puberty, attended by attacks of painful digestion due to hyperæsthesia of the gastric mucous membrane. After twenty years of age, flatulence constitutes the principal symptom, and produces exceptional discomfort by reason

[1] Elevation of the orifice of the common bile-duct, which ensues from the downward displacement of the first part of the duodenum (Fig. 5), also causes bile regurgitation and persistent nausea.

of the fact that expulsion of the gas is rendered difficult by the low position of the stomach. The subjects of this particular disorder can never digest green vegetables, fruits or thin soups, and are immediately affected by a recurrence of the disorder, or by an exacerbation of their existing symptoms, if exposed to fog or cold or subjected to an emotional disturbance. Even a trivial worry or a thunderstorm will produce in certain individuals a severe attack of abdominal distention, constrictive pain at the chest, palpitation of the heart and urgent dyspnœa, attended by violent efforts to expel gas from the stomach. So suddenly do the symptoms develop and so temporary is the effect of evacuation of the organ by a tube, that it would seem probable that much of the carbonic acid gas present in the stomach must have escaped from the capillaries of the mucous membrane. In chronic cases, distention, fullness and discomfort usually develop soon after each meal and gradually subside before the next one. In all cases the flatulence is particularly severe at night, and the patient is obliged to sit up in bed or to walk her room for an hour or more before the expulsion of gas from the stomach or bowel gives sufficient relief to permit of sleep. After an attack, the skin over the upper abdomen remains sore and tender to the touch for several days. These cases are also liable to diarrhœa, accompanied by painful peristalsis, and to attacks of cystitis. It is in the treatment of this particular disorder that dilute hydrochloric acid justifies its inclusion in the pharmacopœia, for it is the only drug which not only relieves the symptoms but also to a great extent prevents their recurrence.

Lastly, about 8 per cent. of the cases of congenital gastrocoloptosis suffer from genuine attacks of pain, independently of food and of other symptoms of gastric or intestinal indigestion. The pain commences suddenly, remains extremely localized during its persistence, and either subsides

in a gradual manner or disappears as quickly as that of renal or biliary calculus. Its favourite site is the centre of the epigastrium, whence it passes through the body to the dorsal spine. It may develop at any time of the day or night and without apparent cause, but in its most characteristic form it is always excited by *physical exertion after meals*. The painful spot is somewhat tender on pressure, but hyperæsthesia of the skin is invariably absent. The duration of the pain varies from an hour to several days or longer, periods of partial remission alternating with exacerbations of great intensity. Occasionally vomiting, shivering or nervous tremors of the hands and head accompany an attack, and as a rule the bowels have been more than usually constipated for a few days prior to the onset of the pain. In other instances, the pain is chiefly referred to the cæcum and ascending colon or it embraces a small area to the left of the umbilicus. These cases are usually regarded as examples of gastric ulcer, gall stones, appendicitis, or enterospasm, but when submitted to operation the only abnormality to be found is a somewhat unusual degree of coloptosis, with considerable descent of the hepatic flexure and perhaps an intrapelvic cæcum or adhesions between the ascending and transverse portions of the large bowel, with one or more adventitious bands. Removal of a thickened or fibrotic appendix is followed by a return of the painful seizures after a few weeks, and fixation of the hepatic flexure of the colon is the only measure which seems to give definite and sometimes permanent relief.

2. THE MIGRAINOUS VARIETY

About 20 per cent. of all cases of congenital gastro-coloptosis seek medical advice for what they term " bilious attacks," " acute indigestion " or " congestion of the liver," in all of which careful inquiry shows that the earliest and

most constant feature of an attack is severe headache. Women are far more subject to the complaint than men, and usually develop the first symptoms between fifteen and twenty-five years of age. In many instances there is a history of migraine in other members of the family, especially on the maternal side, and as a child the patient may have suffered from severe bilious attacks. For many years the attacks may only occur once a month, just before or after the menstrual period, but with the progress of time they become more frequent and are induced by fatigue, excitement, a train journey or a visit to a cinema or theatre. Occasionally, a sense of fullness in the abdomen in the early morning, accompanied by pressure in the head or giddiness, betrays the imminence of an attack, but as a rule it develops quite suddenly and may even be preceded by a feeling of exceptional well-being. The first symptom is headache, which affects the whole vault of the cranium or is confined to the distribution of one of the supraorbital nerves; but the ocular phenomena met with in true migraine are comparatively rare. The pain in the head rapidly increases in intensity and is exaggerated by every movement of the body, stooping or coughing, but is relieved by a recumbent posture. Within a short time nausea supervenes, and in about 40 per cent. of the cases vomiting occurs, accompanied by much straining. Temporary relief may follow the evacuation of the stomach, but the headache and other symptoms soon recur and severe retching ensues at intervals. At first the ejecta may consist of semi-digested food mixed with hyperacid gastric juice; but subsequently they acquire an alkaline reaction and are composed entirely of bile and mucus. In rare instances gastric juice is vomited during the entire attack and the case resembles one of acute hypersecretion. The appetite always remains in abeyance and every attempt to swallow food or fluid is followed by retching or vomiting. The temperature of the body is subnormal,

the pulse small and slow, and the urine diminished in amount. The attack may last for only twelve hours, but more often it continues for a day or even longer. Great debility and mental depression follow the cessation of the symptoms, and many patients lose 2 to 5 pounds during the course of an attack. Between the attacks, discomfort may be experienced after meals and the bowels are invariably constipated. The general tendency of the complaint is to increase in severity until two or three years after the climacteric, when it gradually becomes less frequent and severe, but occasionally the attacks occur at intervals throughout life. Thin or emaciated subjects suffer most severely, and the disorder often subsides at a comparatively early age if the patient increases considerably in weight. When the symptoms disappear they are often replaced by periodic attacks of vertigo, accompanied by nausea and sometimes by tinnitus, which are almost as distressing as the former headache and retching.

3. SPLANCHNOPTOSIS

(Descent of all the abdominal viscera)

This variety of visceroptosis is usually supposed to be acquired during adult life although in most of the severe cases a history of constitutional predisposition, similar to that met with in gastro-coloptosis, can usually be obtained. The chief conditions that produce it are those which give rise to a sudden fall of intra-abdominal pressure accompanied by loss of external support, owing to stretching and attenuation of the abdominal parietes. Women are the principal subjects of the complaint, the ratio of females to males being about 15 to 1. Repeated pregnancies, combined with insufficient rest and neglect to afford support to the abdomen after parturition, are among its most important causes, and the modern habit of allowing a mother to get

up within ten days of the birth of a child and to dispense with a firm abdominal binder is largely responsible for the increased frequency of the condition at the present day. The removal of a large ovarian tumour or uterus, especially if the latter has been associated with excessive catamenia, may exert an effect similar to parturition; while less frequently the evacuation of ascitic fluid or even repeated abdominal section is followed by a moderate degree of splanchnoptosia.

In every instance the intestines suffer greater displacement than the stomach, portions of both the large and small bowel being often found in the true pelvis. In about 77 per cent. the right kidney may be grasped in its entirety between the hands of the examiner, and in about 21 per cent. the left kidney also exhibits considerable displacement and increased movability. Careful examination will also show that the liver usually extends one inch or more below the costal margin, and that its downward excursion varies with the posture of the patient. The uterus almost invariably occupies a lower level than normal, and many women, who are supposed to be suffering from prolapse of the womb or nephroptosis as a primary complaint, are in reality the subjects of splanchnoptosia, of which the renal or uterine prolapse is merely an indication. In about 2 per cent. of the cases splenoptosia may be recognized by palpation of the spleen below the costal margin, and some observers have noted descent of the heart, with flattening of the diaphragm.

Symptoms.—These differ from those of congenital gastrocoloptosis chiefly by the prominence of the nervous as distinguished from digestive phenomena. Many cases put on weight quickly and may appear to be so well that their incessant complaint of ill-health causes them to be regarded by their acquaintances as hysterical or hypochondriacal. In most cases moderate anæmia exists, and is accompanied

by dyspnœa on exertion, palpitation of the heart, giddiness and occasionally by slight œdema of the feet. The appetite is poor and capricious, and the ingestion of any kind of food may produce discomfort at the epigastrium, distention and flatulence. Want of energy and physical weakness are always present, and are often so severe as to render the patient disinclined to leave her bed or couch. The slightest exertion produces exhaustion, and ordinary exercise may be followed by complete prostration. There is also great difficulty of mental concentration, and many complain bitterly of the fact that they cannot add up figures, keep accounts or even read a newspaper. Headache is a variable symptom and when it exists is chiefly felt in the early morning or before meals. Walking or even sitting upright in a chair is accompanied by pain in the lumbar spine or uneasy sensations in the abdomen, while many patients experience a feeling of emptiness in the epigastrium soon after every meal, or a dragging or sinking in the lower abdomen which suggests to their minds that the bowels are "falling out."

Constipation is almost invariable and not infrequently the administration of an aperient is followed by partial collapse. These varied symptoms are always relieved by a recumbent posture, and the comfort experienced by lying in bed accounts for the habits of invalidism which are acquired by so many of these cases. In other respects the disorder does not differ materially from neurasthenia accompanied by myasthenia gastrica.

Diagnosis.—In former days the descent of the stomach was recognized by such clinical methods as auscultatory-percussion, artificial inflation and gastrodiaphany, and although the first named is still extremely valuable reliance is now placed almost entirely upon the results of an X-ray bismuth meal as observed and photographed by an expert. By this method not only are the position and size of the

stomach, as well as its peristaltic activity, easily recognized, but the location of the large bowel and the motor integrity of the intestinal tract is determined and recorded. It must always be borne in mind, however, that valuable as the results of such examinations are, they are often contradictory in character and not always easy of interpretation by the most skilled radiologists, so that the clinical features presented by a case always remain of greater importance, from the point of view of diagnosis, than the fortuitous discovery of some apparent abnormality of the digestive tract.

Complications and Sequelæ

Colitis occurs in about 30 per cent. of all cases which exhibit symptoms of disordered digestion, and is particularly common in those attended by gastric hypersecretion. It ensues at a comparatively late stage of the complaint and is always in evidence when chronic gastritis constitutes its predominant feature. As a rule, it is inconsiderable in degree, and if it were not for the presence of mucus in the stools, to which many people attach such an exaggerated importance, it would often fail to attract attention. In other instances, however, inflammation of the colon is attended by very definite symptoms, such as colicky pains, intestinal distention and the passage of fetid gas. At intervals attacks of diarrhœa supervene, and a loose action of the bowels may ensue after every meal. In other cases somewhat severe pain is experienced over the descending colon or sigmoid flexure owing to the existence of diverticulitis, with local peritonitis, while not infrequently the diseased mucous membrane develops polypi which greatly increase the discharge of mucus.

This secondary colitis is frequently followed *by an extension of the inflammatory disease of the cæcum into the appendix*, which becomes swollen and thickened, and displays a dilated or irregular lumen filled with mucus or inspissated fæces.

The existence of *appendicitis* was noted in 23 per cent. of my cases, and was equally common in the two sexes. In more than one-half of the entire number the organ had been removed before the case came under my observation, in some instances for definite indications of disease but more often in the hope of relieving the symptoms of indigestion. The fact that the appendicitis is usually a secondary and not a primary disease in these cases serves to explain why the operation is rarely attended by permanent amelioration of the gastric disorder. This variety of appendicitis is sometimes accompanied by two very peculiar and interesting phenomena, namely, Glycosuria and Pruritus, which do not appear to have previously been described.

Glycosuria.—The association of sugar in the urine with disease of the appendix was first brought to my notice by the case of a young man who had suffered from intermittent glycosuria for five years. At the end of that time an attack of appendicitis necessitated operation, with the surprising result that the sugar disappeared immediately and permanently from the urine. I have since met with several similar cases, all of which presented identical symptoms and were cured by appendicectomy, so that the relationship between the two complaints would appear to be established. In every instance the patient was the subject of visceroptosis accompanied by dyspepsia, but it is, of course, quite probable that the condition may ensue from primary appendicular disease. No antecedent history suggestive of inflammation of the appendix was ever obtained, nor were any signs of such disease detected. Both sexes were affected and the earliest age at which the glycosuria developed was twenty-two years. Thirst and polyuria were never prominent symptoms, and the amount of urine voided in twenty-four hours rarely exceeded seventy fluid ounces, but there was always complaint of physical debility, mental depression, loss of flesh and sometimes of

pain in the lumbar spine. The body-weight varied with the glycosuria, and whenever the sugar increased in amount or recurred after a remission loss of flesh became a marked feature of the case.

The sugar, which varied in amount from 0·08 to 0·2 per cent., was chiefly encountered before midday or after physical exercise, and frequently disappeared altogether for several weeks in succession. Its irregular occurrence and the small amount present at any time probably accounts for the fact that the condition is usually overlooked. After removal of the appendix both the glycosuria and its attendant symptoms usually disappear within three weeks and never recurred in those cases which remained under observation, extending in one instance over a period of twenty years. I believe that the etiological connexion between the two complaints is to be found in the mild gastric hypersecretion that so often ensues from latent disease of the appendix and which sets up inflammatory changes in the pancreas in persons who possess a natural proclivity to such disease.

Pruritus.—Another rare and peculiar phenomenon occasionally encountered in these cases of latent disease of the appendix is intense irritation of the skin. I have only met with four instances in which the connexion between the two complaints was established, but it is very possible that I have overlooked others. All the patients were women between twenty-seven and forty years of age, and in one instance the symptom had persisted without intermission for more than four years. The characteristic feature of the complaint is excessive itching, without any skin eruption, which usually develops soon after the patient retires to bed and persists for several hours, although an attack may also supervene at any time of the day. The irritation is described as being " under the skin " and was likened by two patients to the sensation of a maggot burrowing its way through the subcutaneous tissues. Scratching and rubbing afford no

relief, but some comfort is experienced by firm pressure and by the application of a hot water bottle. In other instances, or at other times, an evanescent irritation occurs at different parts of the body, disappearing suddenly from the chest or abdomen to attack the flexures of the forearms or popliteal spaces, whence in turn it may be transferred to the neck, buttocks or interscapular region. Less frequently the pruritus is replaced by sensations of burning or scalding, which are only relieved by hot fomentations. In one instance the lady's life was an absolute misery and she dreaded the prospect of going to bed because of the intolerable "scalding" which invariably attacked the skin over the lower half of the abdomen and prevented sleep until about five o'clock in the morning. Every variety of treatment had been tried without success and the patient had abandoned hope of a cure, when she was suddenly attacked by acute appendicitis which necessitated immediate operation. A few days later she remarked upon the absence of her nocturnal trouble, which indeed never recurred after the day of operation. The appendix was found to be packed with hard fæces with recent acute inflammation at its free extremity. The same sequence of events was observed in the other three cases. In yet another instance in which the same peculiar and intractable nocturnal pruritus led me to suspect disease of the appendix, the patient was seized with acute appendicitis while on a visit in the country, which subsided under medical treatment. When I saw her again some months later I learnt that the irritation of the skin had gradually diminished after her illness and was then a negligible symptom. Apparently, in this case acute inflammation of a portion of the appendix either destroyed the source of some peculiar toxin or directly influenced the nerves of its mucous membrane and thereby inhibited certain reflex phenomena. The subject is of considerable clinical interest and merits more extended

investigation. The occurrence of urticaria in cases of hypersecretion has already been described (p. 91).

Recurrent Icterus.—About 2 per cent. of the cases of gastro-coloptosis suffer at intervals from mild attacks of jaundice. The disorder is very apt to occur during the spring and autumn and is sometimes accompanied by slight fever. It is usually ascribed to a chill, and is certainly most frequent when the weather suddenly becomes cold and wet. A sensation of chilliness or shivering precedes the development of acute indigestion, which takes the form of abdominal distention and discomfort, with eructations of gas, nausea and retching. The appetite is abolished, and complaint is made of extreme malaise, debility, headache, palpitation of the heart, and not infrequently of a form of inspiratory dyspnœa. True vomiting is rare, but there is often looseness of the bowels with griping pains in the abdomen. If the temperature is elevated it rarely exceeds 101° F., and the febrile disturbance seldom persists more than thirty-six hours. After a few hours the digestive disorder tends to diminish in severity, but the next day the conjunctivæ are found to be yellow and the urine to contain bile. As a rule the skin only exhibits a slight degree of jaundice, but occasionally the colour becomes quite deep and is accompanied by pruritus. If the patient remains in bed and is carefully treated, the dyspeptic symptoms subside and within a week the icteric phenomena also disappear. These attacks are often supposed to indicate gall-stones, and indeed closely resemble those of infective cholangitis associated with a floating stone in the common duct; but the symptoms are much less severe and more transient in character. They are probably due to acute gastro-duodenitis, with local infection of the ampulla of Vater and never lead to permanent jaundice or pancreatitis.

Acute Dilatation of the Stomach.—This condition, which

results from sudden paralysis of the motor apparatus of the stomach combined with continuous secretion, is a very rare and dangerous complication of gastroptosis. I have only met with three genuine examples, in one of which the complaint developed during a severe attack of influenza, while in the other two a physical injury and a profound mental shock were apparently the cause of the gastroplegia. The actual symptoms were identical in character with those which accompany the usual varieties of the disease, and consisted of repeated vomiting of large quantities of turbid fluid, containing free hydrochloric acid, followed by profound collapse. Two cases, which were promptly treated by repeated aspiration of the stomach and lavage eventually recovered; but the third died before these effective measures could be applied. At the autopsy, an enormous, thin-walled stomach was found to occupy the whole of the anterior portion of the abdominal cavity, with such an acute flexion of the duodenum at the junction of its first and second parts that the contents of the stomach could not be squeezed into the bowel by manipulation without elevation of the organ to extend the angle of flexure. There was no ulcer of the duodenum or other signs of disease. Among the other sequelæ of the complaint, *rheumatoid arthritis* was observed in 8 per cent. of the female subjects, usually after the climacteric; in another 9 per cent. gall-stones existed, while 5 per cent. developed either duodenal or gastric ulcer, the former being almost entirely confined to the male sex and the latter to women. The low-lying stomach occasionally becomes twisted upon its axis, with the formation of a kind of volvulus. Of this rare condition Wiesinger has reported an instance, and Beck operated upon two cases of a similar nature.

Treatment.—*General.*—Much may be accomplished in the alleviation of visceroptosis by careful attention to the conditions which aggravate the various symptoms which are

apt to accompany it. Although tight lacing and the use of strings and bands round the waist have fallen into disfavour, the modern habit of dispensing with all forms of abdominal support, affected by so many women, has greatly tended to increase their natural liability to visceral displacement. The girl who devotes all her time and energy to outdoor pursuits and sports vainly imagines that she thereby develops all the muscles of her body and ensures a perfect state of health; whereas, as a matter of fact, she merely discriminates in favour of special muscles which are required by her games, and neglects to develop or even to maintain in efficient condition those which promote the normal equilibrium of the body. As soon as it is able to sit up, a child unconsciously learns to balance its skeleton in various postures by the co-ordinated action of various antagonistic muscles, so that forced attitudes, such as standing, stooping and sitting are gradually adopted without effort and maintained without discomfort. But the preferential development of certain groups of muscles, combined with the comparative disuse of others, invariably leads to asymmetry or even to actual deformity of the figure, the chief characteristics of which are an enlargement of the shoulders, hips and extremities associated with enfeeblement of the spinal, lumbar and abdominal muscles, whereby sedentary occupations are rendered irksome and the maintenance of postures actually painful. For these reasons the athletic girl of to-day, when she develops symptoms of visceroptosis, not only finds prescribed rest an annoyance, but often truthfully declares that it tires her more than physical exercise; while the insult which her sense of debility appears to offer to her vaunted opinion of her "fitness" makes her at all times extremely difficult to manage and her complaint most intractable to treatment.

The essential factor in the treatment of the complaint is the application of a firm belt to the abdomen, which helps

to support the viscera and to relieve the exhausting sensations of downward displacement. Numerous varieties have been devised for this purpose (Glénard, Landau, Teufel), but no stock pattern can be prescribed without previous trial, since a belt which suits one case often fails to relieve another. Many of the special corsets advertised for the treatment of the complaint are not only extremely expensive but tend to aggravate rather than relieve it, while the corset-belt is seldom of much value. When the patient is fairly well nourished an effective fillet may be made at home with elastic five inches in width, the length required being two inches less than the circumference of the body round the hips in the naked state. The elastic is firmly sewn up like a garter and is drawn up over the vest or combinations and kept in position by means of elastic perineal bands or suspenders attached to the stockings. The anterior crests of the ilium should correspond to the centre of the belt in the upright posture. When the patient is very thin the undue prominence of the pelvic bones often prevents the use of an elastic band, and in such cases the Curtis spring-belt is of greater value; but care should be taken to have it carefully adjusted from time to time. The existence of localized tender areas of the abdominal wall may necessitate the employment of a soft, many-tailed bandage. As a rule the belt is only used during the day, and at night some patients find considerable mental if not physical comfort by elevating the foot of the bed from four to six inches.

The fact that pregnancy and parturition invariably increase the degree of visceroptosis and exaggerate the symptoms arising from it, renders it necessary to adopt special precautions under these circumstances. During pregnancy many patients feel exceptionally well and not only suffer little from vomiting, but may lose their former indigestion, owing to the gradual elevation of the stomach and colon by the enlarging uterus; but a few days after

parturition they are apt to develop excessive flatulence, abdominal distention, nausea, retching and even severe attacks of colic, which are extremely difficult to relieve and may even cause anxiety. The modern practice of allowing a woman to leave her bed on the tenth day and to dispense with the old-fashioned bandaging of the abdomen is productive of much permanent injury to health. Too much care cannot be taken of the abdominal parietes in these cases, and after ten days or more of careful bandaging, daily massage of the muscles should be prescribed, and a well-fitting, comfortable belt or binder be applied in the intervals. In many cases a cord attached to the end of the bed, which enables the patient to pull herself up and down with moderate muscular effort, helps materially to strengthen the recti and oblique muscles. The lying-in period should occupy at least one month, and care should be taken to avoid any excess of fluid nourishment and to keep the bowels in regular action, so as to minimize, as far as possible, the effects of gaseous distention of the stomach and intestines. The same precautions must be adopted after operations undertaken for the removal of chronic ascites or a large tumour from the abdomen.

Owing to the neurasthenia that invariably accompanies visceroptosis, the patient should be advised to lie down, and sleep if possible, for one hour each day after lunch, and when resting in a chair to support the feet at an elevation higher than the pelvis. In chronic cases, accompanied by progressive emaciation and debility, a modified rest cure, combined with massage and perhaps with electricity, is of great value ; but the amount of milk and other fluids must be adjusted to the requirements of every individual case, since much damage may be done to the digestive organs by the routine administration of a milk dietary. Milk soured and curdled by the lactic acid process is often a useful adjunct to the mixed dietary.

Washing out the stomach, or lavage, is chiefly of value when stagnation and decomposition of the food occur owing to secondary gastritis or gastrectasis. It should always be performed in the morning before breakfast and continued each day until sufficient improvement warrants its omission. As a rule, two quarts of warm water are sufficient for the purpose, but a little bicarbonate of sodium may be added to it if the mucous contents of the stomach are unusually copious or viscid. Antiseptics are never necessary and their use is not devoid of danger. Intestinal douches are of considerable value when colitis complicates the original complaint or when the administration of aperients causes pain or distress. They should be administered at a low atmospheric pressure and preferably after the patient has retired to bed for the night. The insertion of a long tube into the bowel and forcible pumping of fluid through it must be avoided, as they not only give rise to much discomfort but usually cause the liquid to be evacuated before it has reached the descending colon. The apparatus consists of the ordinary graduated reservoir of glass, to which is attached a long tube provided with a tap and a soft rectal piece. Two quarts of water at a temperature of 112° F. are poured into the tank, which is placed two feet above the level of the mattress. The rectal piece is inserted about six inches into the rectum, with the patient lying on her left side, and the tap is turned half-on. If the fluid is introduced thus into the bowel in a gradual manner, no discomfort is experienced and it is able to penetrate as far as the splenic flexure or even into the transverse colon in the course of about forty minutes. When sufficient water has been used the tap is turned off, the tube withdrawn, and the patient turns upon her back so as to allow gentle massage of the colon in the direction of the cæcum. She then gets up and evacuates the fluid. The process is repeated each night for a fortnight or longer

and subsequently two or three times a week or when deemed advisable.

Diet.—The food must be regulated according to the necessities of each case and the existence or otherwise of complications.

Visceroptosis associated with healthy intestinal functions and good gastric compensation merely requires a full diet composed of substances that are easily digested. Moderately cooked and tender meats, fish, game, eggs, sweetbread, tripe, sheep's head, calf's head and feet, well-boiled cereals, farinaceous puddings, and a moderate amount of fruit may be allowed; and the patient should be encouraged to drink milk with the meals and to indulge in cream and other forms of fat. Raw vegetables, pastry, sauces, pickles, and cheese should be avoided. When emaciation is a marked feature of the case and is attended by neurasthenia, a milk diet is often of great value, 5 pints mixed with a small proportion of lime-water being administered in divided doses during the course of the day.

Gastroptosis accompanied by myasthenia requires a diet suited to this important complication. The great principles to be borne in mind are to supply the stomach with those forms of food which are most easy of digestion, to avoid over-distention of the organ, and to allow a sufficient interval to elapse between the meals in order that the viscus may completely empty itself on each occasion.

Sugars and fats in excess are always injurious, owing to the tendency of the former to undergo fermentation and of the latter to stagnate in the stomach. Butter and cream may be allowed in moderation, as well as rice and well-cooked oatmeal porridge. Lean meats, white fish, fowl, game, and eggs may be given, but soups and broths should be avoided. Spinach and asparagus may be taken in small quantities, but raw and coarse vegetables are difficult of digestion. An exclusive milk diet rarely agrees, owing to

the distention of the stomach which ensues from the introduction of large quantities of fluid, and at most 8 ozs. should be taken with each meal. Weak tea may be allowed, but cocoa often proves injurious from the sugar it contains. A decoction of cocoa husks or cocoa nibs forms a palatable drink, and is free from the disadvantages which pertain to the other varieties. If the patient is accustomed to take alcohol, a little good brandy or whisky may be allowed; but, as a rule, half a tumblerful of hot water, sipped at the end of the meal, is more beneficial.

When colitis complicates the gastric displacement, the diet should consist entirely of finely minced fish, poultry, tripe, sweetbreads, sheep's brains, dry toast, meat juices, clear soup without vegetables, potatoes, and plain milk puddings. Green vegetables and fruits are particularly harmful, and, as a rule, red meats should be avoided. Vichy or Contrexéville water may be taken with the meals.

Medicinal.—Each type of the disorder requires special treatment. In the great majority of the cases, especially at any early stage, the secretion of gastric juice is excessive and much free hydrochloric acid is present in the stomach. In these cases the exhibition of alkalies is always indicated, and a prolonged course of bismuth, combined with bicarbonate of sodium, magnesia, carbolic acid and glycerin, seldom fails to afford relief. At the same time it is advisable to administer a saline draught in hot water each morning before breakfast, for which purpose sulphate of sodium mixed with the neutral phosphate is usually the best. The salts of magnesium are not so effective and the natural aperient waters are of little value. When nausea is a prominent symptom half a grain of mercury and chalk should be given each night or five grains of the mercury and rhubarb pill twice a week. These cases are most intolerant of mineral acids, bitters, and all so-called tonics, and the symptoms of indigestion are always aggravated

and even excited by the use of iron, quinine, strychnine, nux vomica or iron, while the use of aloes frequently promotes hæmorrhoids. In that peculiar variety which is associated with diminution of gastric juice and subacidity, alkalies usually do more harm than good and reliance should be placed upon dilute hydrochloric acid, combined with capsicum and glycerin. The mixture is given twice a day after meals and should be suspended for a few days every fortnight. A mild mercurial pill should also be given two or three nights each week. The various artificial digestives are useless in these cases and takadiastase does not appear to increase the digestion of starches; but occasionally, and especially in elderly people, the special preparation by Savory & Moore known as Fructole pepsinæ Co. is of considerable benefit and is always worthy of trial in obstinate cases.

The migrainous variety responds most readily to a prolonged course of bromide of potassium, combined with alkalies and if necessary with the solution of bismuth. An aperient is always required, and failure to obtain a daily action of the bowels is invariably followed by severe headache. For this purpose nothing is of such value as a pill composed of creasote, podophyllin, colocynth, hyoscyamus, and rhubarb, which is given every night and continued for many months. All "tonics" increase the headache or produce giddiness. It is also advisable to order suitable spectacles, and the patient must be warned against looking out of the window during a long journey and against cinema exhibitions, since the eye strain involved by watching moving objects is extremely apt to excite an attack. A dose of migranin and aspirin taken when the attack begins and repeated, if necessary, after two hours will often prevent the development of severe headache or vomiting.

Splanchnoptosis usually requires more attention to the general health than to the digestive organs. In all cases

the bowels must be regulated by suitable aperients or douches, but drastic purgatives should be avoided. If anorexia is a prominent symptom, phosphoric acid with gentian may be prescribed between meals, and the physical exhaustion combated by such drugs as quinine, strychnine, valerianate of zinc, and phosphorus.

Surgical treatment.—There is a great tendency at the present day to regard all abdominal complaints as amenable to surgical treatment and any signs of food stasis in the stomach or intestine, as revealed by the X-rays, as indications for the performance of an operation. This hasty and mistaken view of the treatment of the complaint has been productive of immense injury not only to patients themselves but to the reputation of the medical profession, and it cannot be too freely emphasized that surgical interference should only be advocated in those cases which have developed serious complications like appendicitis or gastrectasis, or in which persistent pain indicates abnormal displacement or obstruction of some part of the alimentary tract.

Fixation of the right kidney or the uterus, without definite and obstinate local symptoms, is merely tinkering with the more obvious prolapse of certain organs, while operations undertaken for the downward descent of the stomach and enteron, which have been loudly proclaimed as a cure for the complaint, are not only attended by a high mortality but seldom relieve for more than three months the symptoms for which they had been undertaken. On the other hand, obstruction of the intestine by bands or membranes must be dealt with and fixation of a prolapsed stomach, which has produced kinking of the duodenum, may become necessary; but gastro-jejunostomy is seldom successful and more often productive of harm than good.

CHAPTER VII

DYSPEPSIA DUE TO THE PRESENCE OF FOREIGN BODIES AND LIVING CREATURES IN THE STOMACH

Hair-Balls, Bezoars, Gastroliths, Larvæ, Beetles, Slugs, Lizards, etc.

Symptoms of gastric irritation always ensue from the presence of a foreign body in the stomach. It is well known that persons of unsound mind will sometimes swallow substances of considerable size and of the most varied nature, nails, bandages, knife-handles, forks, spoons, pieces of glass, and other articles of hardware, having one and all been discovered in the digestive organs of lunatics. Children and hysterical individuals are also apt to ingest insoluble substances which give rise to inflammation of the stomach and intestines, while occasionally jugglers undergo the unpleasant experience of being unable to recover the swords or knives which they had swallowed for the amusement of their audience. In almost all these cases, however, the history will at once indicate the origin of the abdominal trouble and the Röntgen rays will demonstrate the nature or location of the foreign body. On the other hand, there is a very important class of chronic dyspepsia, in which the disorder depends either upon the gradual formation in the stomach of a mass of hair, cotton, or vegetable fibre, the constituent threads of which had been swallowed at intervals during a long period of time, or of large concretions of resin introduced into the body in the form of an alcoholic solution. In other cases, again, the indigestion is due to the presence in the stomach and intestines of a vast number

of living larvæ of various flies or beetles which excite a severe form of gastroenteritis and may even multiply within their host. It is with such unusual and obscure causes of dyspepsia that the present chapter is concerned.

(1) HAIR-BALLS AND OTHER CONCRETIONS

Hair-balls of sufficient size to attract attention are very rare, and I have been able to collect only twenty-five cases, the first of which was recorded by Baudamant in 1777.[1] When comparatively small, the mass is round or oval in shape and occupies the pyloric region, where it acts like

FIG. 6.—A hair-ball (about one-half natural size).

a ball-valve ; but as it increases in size it becomes moulded by the gastric contractions, until it forms a solid cast of the organ, and may even extend upward into the œsophagus (Best) or through the pylorus into the jejunum (Gull, Pollock). It is smooth on the surface, compact and heavy, and consists of a vast number of hairs, varying from 2 to 12 inches in length, which are closely interwoven and agglutinated by mucus and food débris. In Gull's case the

[1] Schönborn states that in the year 1883 only seven cases had been recorded. He appears, however, to have overlooked English and American literature.

component hairs were of three colours and could be recognised as belonging to the patient and her two children. Sometimes the hair is mixed with cotton, thread, or pieces of string. The largest concretion on record weighed 4 lb. 7 ozs. (Russell) and the smallest 5¾ ozs. The habit of swallowing hair is not confined to the human subject, but is met in the lower animals, and especially in cats, the Angora breed of which are said frequently to die from gastric concretions, owing to their habit of eating their fur when it is shed at certain periods of the year (Chepmell). Lunatics usually prefer harder substances, such as nails and crockery, but in a case recorded by Quain fatal perforation of the stomach was caused by a ball of coconut fibre weighing 4 lb.

Concretions of *vegetable matter* are occasionally found in the stomachs of persons who have consumed large quantities of fibrous roots or of other substances, owing to a perverted appetite or from a superstitious belief in their medicinal properties. Thus, in Kooyker's case a mass of starch and vegetable fibre weighing 29 ozs. was found in the stomach after death, while in that recorded by Schreiber the organ was completely filled by a mass of roots (Schwarzwurzel).

Stones or *gastroliths* are very rare, and I have been able to find only four authentic cases in the literature. They usually consist of shellac, which had been introduced into the stomach in the form of an alcoholic polish or varnish, and may be either single or multiple (Friedländer). As a rule, they do not exceed 3 ozs. in weight, but in the case related by Tidemand the mass weighed 1,500 grm.

The local effects of a concretion consist of dilatation of the stomach and chronic inflammation and atrophy of its mucous membrane, while occasionally the organ becomes fixed by adhesions to the pancreas or abdominal wall (May). When the œsophagus or the duodenum is involved the orifices may be greatly dilated. In more than one-half of the cases death occurred from perforation of the stomach

in the pyloric region, or, as in those related by Gull and Yeo, from a similar lesion of the duodenum. Hæmatemesis was responsible for the fatal termination in one instance (Russell), and intestinal obstruction in several others (Ritchie, Friedländer). Occasionally the irritation of the mass gives rise to superficial erosions or even to papillomata (Best).

Symptoms.—The symptoms of a dyspepsia due to the continued presence of a foreign body in the stomach will obviously vary with the nature and size of the irritant substance, but in all cases the immediate cause of the gastric disorder is to be found in a chronic inflammation of its mucous membrane excited by direct contact with the concretion. When the latter is small and comparatively injurious, the gastritis does not differ materially from other varieties met with in practice, and no secondary disease of the stomach or intestines ensues; but, if the substance be of considerable size and of solid consistence, the initial gastritis is almost invariably followed by ulceration of the stomach or bowel, and the case often terminates fatally by hæmorrhage or perforation. In these latter conditions it is therefore necessary to distinguish an initial dyspepsia, in which the gastric symptoms depend upon simple inflammation of the stomach, from the terminal stage which is characterized by evidences of ulceration.

Hair-balls.—Out of the twenty-five cases of this variety no fewer than twenty-four were females, the youngest of whom was eight and the oldest thirty-four at the time of death or operation. There were never any indications of mental disease, and in several instances it was expressly mentioned that the patient was neither hysterical nor particularly emotional.

The habit of hair-swallowing is usually acquired in early life, when the hair is worn loose upon the shoulders. In the majority of cases it originates in the trick frequently practised by young girls of holding a lock of hair in the mouth

while reading a book or of biting the ends of a coil when angry or excited. In other instances it seems to arise from the inclination, which is so strongly marked in certain people, to fill the mouth with any substance with which they happen to be working, such as cotton in the case of dressmakers, wool or thread among weavers, and tow, flock, or coconut fibre among those engaged in the manufacture of mattresses and mats. Finally, it may be due to some acquired eccentricity of which the patient herself is often quite unconscious. Thus, in one case the husband stated that whenever his wife was unusually interested in a subject she invariably pulled out two or three hairs from the back of her head and put them into her mouth, while in another it was observed that the lady would frequently pluck hairs from her children's heads when she caressed them or played with them. In the instance recorded by Inman the patient was accustomed to clean her comb with her fingers, and quite unwittingly to put the little bunch of loose hair into her mouth instead of into a toilet tidy. In each of these conditions it is probable that the mouth and throat became so tolerant of the presence of the foreign substance that the hairs were eventually swallowed without creating any unpleasant symptoms.

Until the concretion has attained a considerable size and seriously diminished the capacity of the stomach, it seldom produces any special symptoms, and even when the organ is completely filled with hair the patient may be quite free from pain and vomiting (Russell, Thornton). As a rule, however, after a prolonged period of more or less pronounced dyspepsia she begins to experience severe pain after meals, withflatulence, distention and nausea. Gradually the pain becomes localized to the epigastrium or left hypochondrium, and is increased by exercise or pressure upon the part. Vomiting is seldom absent, and may occur after every meal. The ejecta are small in quantity, acid

in reaction, and may contain altered bile if the concretion involves the duodenum. Occasionally the vomit is stained with blood, but hair has never been observed in it. Anæmia is always a noticeable feature of the case, and may be accompanied by palpitation, dyspnœa, and œdema of the feet. The appetite is variable, but sometimes continues good; the tongue is foul, the breath offensive, and attacks of diarrhœa are apt to alternate with periods of troublesome constipation. Progressive loss of flesh is seldom observed except when vomiting is excessive.

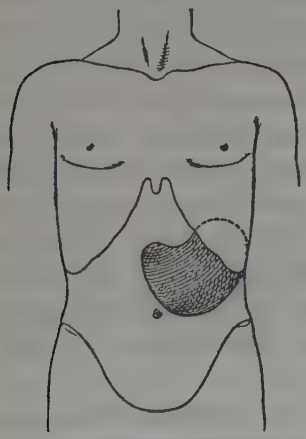

FIG. 7.—Tumour formed by a hair-ball in the stomach.

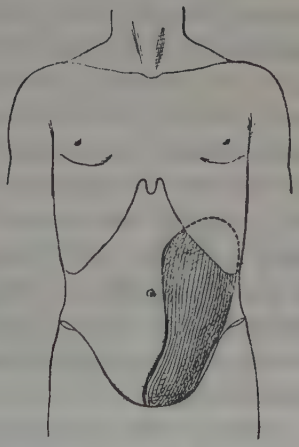

FIG. 8.—Tumour formed by a large hair-ball which has produced dislocation of the stomach.

Physical Signs.—In every case there is a well-marked abdominal tumour, which is often large enough to be visible through the parietes. When the concretion is comparatively small the tumour is globular in form and occupies the epigastrium, but in advanced cases it approximates closely to the shape of the stomach, and was variously described in the recorded cases as "kidney-shaped," "crescentic," or "like a spleen." As a rule, it is situated in the epigastrium and left hypochondrium, but it may involve the

umbilical and the left lumbar region. In Russell's case the stomach was so displaced that the pylorus lay in the pelvis and the tumour occupied the whole of the left side of the abdomen.

On palpation the mass feels hard, smooth, and superficial, and has a well-defined lower border. It is dull on percussion and seldom tender, except after prolonged manipulation or when the stomach is ulcerated. One of the principal features of the tumour is its extreme mobility, which permits it to be displaced downward and to the left or to be pushed upward beneath the costal margin in the direction of the spleen. At a late stage of the complaint, however, adhesions may form which fix the organ to the pancreas or abdominal wall (May). Peristaltic movements of the stomach are rarely visible, but flatus may sometimes be seen or felt in the tumour (Best). Sometimes other hard, globular, and movable masses may be detected to the right of the navel or in the iliac fossa from the presence of hair-balls in the duodenum or ileum. In every case the tumour enlarges very slowly, and except perhaps for a sensation of weight or dragging, does not give rise to any special inconvenience.

Duration and Complications.—The duration of the disease is difficult to determine, but it probably averages about fifteen years. In May's case the patient was known to have practised hair-swallowing for twenty-two years, and in that recorded by Russell the tumour had been detected at the age of fourteen. From its slow growth during adult life it is probable that the greater part of the concretion is formed during childhood. With the exception of two instances in which laparotomy was performed, all the cases ended fatally. In about one-half death was due to ulceration and perforation of the stomach; fatal hæmatemesis occurred in one instance, while in two others intestinal obstruction was responsible for the lethal event. In all

the rest death ensued from exhaustion due to vomiting and diarrhœa.

Case I.—A girl, eighteen years of age, had suffered for some time from pain and vomiting after food, a capricious appetite, and looseness of the bowels. In the epigastrium there was a tumour about the size of an orange, globular in shape, somewhat movable, and of very slow growth. The patient suddenly became collapsed, and died of peritonitis. At the necropsy the stomach was found to be filled by a mass of hair and string, which was moulded to the shape of the organ and measured 6 inches long, $3\frac{3}{4}$ inches in width, and $2\frac{1}{2}$ inches in thickness. A second cylindrical mass measuring 14 inches in length filled the duodenum and extended into the jejunum. A chronic ulcer of the stomach had perforated into the peritoneal cavity.—*Pollock.*

Case II.—A lady, thirty-one years of age, was suddenly seized with severe hæmatemesis. She had not suffered from any gastric symptoms previously, but was known to have had an abdominal tumour since the age of fourteen. The tumour now occupied the whole of the left side of the abdomen and extended from beneath the left costal margin to the pelvis. It moved with respiration, was dull on percussion, and had a hard, smooth surface. The inner border was slightly concave, well defined, and apparently presented a notch about its centre. It resembled a spleen in every particular, with the possible exception that its length was somewhat out of proportion to its width. The hæmorrhage proved fatal. A necropsy showed that the tumour was composed of the stomach, which was almost vertical in position, with the pylorus in the cavity of the pelvis. Its contents consisted of a firm mass of hair measuring 12 inches in length, 5 in width, and 4 in thickness, and weighing 4 lb. 7 ozs. The individual hairs were of all lengths up to 20 inches. The lady's husband stated that whenever his wife became excited she was in the habit of pulling two or three hairs from her head and putting them into her mouth.—*Russell.*

Case III.—A factory girl, aged twenty-one years, was admitted into hospital with the symptoms of acute intestinal obstruction. A large movable tumour could be felt in the epigastrium. After death the stomach was found to contain a mass of hair weighing

21 ozs., which had produced extensive ulceration of the viscus. The ileum was ruptured just above the cæcum, and on either side of the lesion was a ball of hair, the larger of which weighed 1½ ozs. and had obstructed the intestine at the ileo-cæcal valve.—*Ritchie.*

Case IV.—A girl, fifteen years of age, came under treatment for an abdominal tumour. For three years she had suffered from severe pain and vomiting after food. The tumour, which occupied the epigastrium and left hypochondrium, felt like a large kidney with the hilus upward and to the right. It was hard, freely movable, dull on percussion, and somewhat tender. An exploratory operation proved that it was contained in the stomach, and when the organ was incised a large mass of hair was found and removed. After the patient had recovered it was ascertained that for at least four years she had been accustomed to swallow hair in order to improve her voice.—*Schönborn.*

Vegetable Tumours.—These are even rarer than the preceding, and consist of undigested vegetable material, fruit skins, cherry stalks, or the fibrous roots of certain plants which had been swallowed on account of their reputed medicinal virtues.

Except that they occur at a somewhat later period of life, the symptoms are similar to those already noted. For several years there is complaint of pain and vomiting after food, with loss of appetite, emaciation, and an irregular action of the bowels. Occasionally hæmatemesis and cachexia are also observed. The tumour is seldom as large as a hair-ball, and is usually globular in shape and situated in the epigastrium. As a rule, death ensues from perforation of the stomach, hæmorrhage, or exhaustion, but occasionally the foreign body undergoes disintegration and is either vomited or evacuated by the bowel.

Case V.—An individual, fifty-two years of age, came under medical treatment for severe pain and vomiting after food, with progressive loss of flesh. Hæmatemesis had occurred at intervals, and there was marked cachexia. In the epigastrium a round tumour the size of a small apple could be felt, which was dull

on percussion, movable, and slightly tender. The diagnosis was obscure, and opinions varied between enlarged spleen, a floating kidney, and malignant disease of the stomach or transverse colon. Death occurred from exhaustion at the end of three years. At the necropsy the tumour was found to be within the stomach, and to consist of a kidney-shaped mass of vegetable matter weighing 29 ozs., with two other masses, each about the size of a hen's egg.—*Kooyker.*

Case VI.—A woman, aged forty-three years, complained of violent pain in the abdomen after meals, vomiting, and constipation. Under the ensiform cartilage a hard, fixed, and tender tumour could be felt. When these symptoms had existed for a considerable time an exceptionally violent fit of vomiting caused the expulsion of a large sodden mass of vegetable matter, after which the patient made a good recovery.—*Capelle.*

Case VII.—A woman, forty-five years of age, was admitted into hospital for an abdominal tumour accompanied by pain and vomiting. The tumour resembled a large spleen, but as it was ascertained that the patient had eaten a quantity of a plant which superstition endowed with marvellous powers of healing, a diagnosis of phytobezoar was made, and a large mass of fibrous roots was successfully removed from the stomach by operation. —*Schreiber and Eiselsberg.*

Gastroliths.—The subjects of this curious complaint are usually men about middle age who, in their morbid desire for alcohol, for a long time have drunk varnish, polish, or similar liquids containing it. As a rule, the stone is too small to be detected during life, but in the case recorded by Tidemand a large, hard tumour could be felt in the epigastrium. Symptoms of gastric irritation with vomiting are almost always present and hæmatemesis is sometimes observed. Death ensues from exhaustion, perforation of the stomach, or from intestinal obstruction (Friedländer, Langenbuch).

Case VIII.—A polisher, forty-four years of age, was admitted into hospital with the symptoms of chronic gastritis. He was extremely intemperate in his habits, and the gastric disorder was

consequently attributed to alcoholism. After the lapse of some months he succumbed to pulmonary tuberculosis. At the necropsy a chronic ulcer was found in the stomach near the pylorus, and close to it an oblong mass of stone which measured 10 cm. in length and 5 cm. in width, and weighed 75 grammes. Chemical examination showed the concretion to be composed of shellac, and it was afterward ascertained that the man had been accustomed to drink the polish he used in his work, which consisted of shellac dissolved in alcohol.—*Manasse.*

Diagnosis.—It is probable that small concretions not infrequently occur in young girls who bite or suck their hair; but when the habit is discontinued, as it usually is after the hair has been dressed in the adult style, the material is gradually evacuated without the production of serious consequences. In one very obstinate case of dyspepsia which came under my notice the sides of the forehead had been quite denuded of hair by this pernicious habit, and it was only after the dangers attending a hair tumour had been explained to the young lady and measures adopted to prevent a repetition of the practice that the gastric complaint gradually disappeared. It is, therefore, advisable in every case of obstinate dyspepsia in a girl for careful inquiries to be instituted with regard to her habits and occupations, and whenever an abdominal tumour is discovered in a young adult, the possibility of a foreign body in the stomach should be borne in mind.

If pain and vomiting are prominent features of the case, the discovery of a tumour in the abdomen is usually suggestive of malignant disease of the stomach or intestine. In such cases three points deserve special attention, namely, the age and sex of the patient, the duration of the complaint, and the character of the tumour. Cancer of the stomach is very rare before the age of thirty, and its precocious development is chiefly met with in men, while hair tumours commence at or before puberty and are practically confined to women. The malignant disease is seldom preceded by

symptoms of indigestion, and usually runs such a rapid course in young persons that life is destroyed within seven months; gastric concretions, on the other hand, are attended for a long time by pain and sickness after meals, and seldom prove fatal in less than ten years. Lastly, a cancerous tumour is irregular, nodular, tender, more or less fixed in position, and of rapid growth, while in most instances the stomach is dilated, marked cachexia is present, and the gastric contents are devoid of free hydrochloric acid. A hair tumour is globular or crescentic in shape, situated principally in the left side of the abdomen, is smooth, hard, and painless on palpation, and so freely movable that it may be pushed under the left costal margin. There is no ascites or jaundice, the outlines of the stomach are indistinguishable from those of the tumour, and a tube cannot be inserted more than 2 inches into the viscus. X-ray examination should never be neglected.

A painless tumour in the upper part of the abdomen, which is not attended by special symptoms and has been discovered in an accidental manner, is most likely to be confused with an enlarged spleen, a floating kidney, or a fæcal accumulation in the colon.

If the stomach happens to be dislocated, as in Russell's case, the diagnosis from an enlarged spleen is extremely difficult. It may usually be observed, however, that the tumour is exceptionally movable, and that its length is out of proportion to its breadth. The inner margin is less distinct than in the case of a spleen, the characteristic notch is absent, and the passage of a soft tube or inflation of the stomach will at once show that the tumour is gastric in origin. A loose kidney on the left side can usually be displaced downward as well as upward, and its point of attachment is much lower than that of an enlarged stomach. It also lies behind the intestine, so that the percussion note is resonant rather than dull, and manipulation is often attended

by pain. In case of doubt, inflation of the stomach should be practised or the X-rays employed, when the relation of that organ to the tumour can easily be ascertained.

A fæcal mass in the colon is more irregular in shape and less definite in outline than a gastric concretion. It is less hard to the touch, and may even be soft enough to indent with the finger, while other tumours of a similar character may be found in the cæcum, sigmoid flexure or rectum. The passage of a tube shows that the stomach is empty and situated above the tumour, and the administration of several large enemata will either diminish the size of the mass or remove it altogether. X-rays usually demonstrate the location of the mass.

Treatment.—If the tumour is small in size, it may be possible to secure its evacuation by an emetic; but this method is always fraught with a certain amount of danger, on account of the ulceration of the stomach which is often present. In the case of large tumours medicinal remedies are valueless, and recourse must be had to operation. In the cases reported by Knowsley Thornton and Schönborn the mass was successfully removed after the nature of the tumour had been determined by an exploratory incision, while in that recorded by Schreiber a correct diagnosis of phytobezoar was made by the physician and the concretion extracted.

(2) LIVING CREATURES

The frequent occurrence of entozoa in the human subject is probably responsible for the superstitions that have been current for many centuries regarding the harbourage in the stomach of various strange animals, which, subsisting upon the food of their host or even upon the structures of the viscera, give rise to a series of weird symptoms that usually terminate in an agonizing death. Such stories have not only obtained credence among all classes of the

population throughout the entire world, but have frequently been recorded and commented upon by members of the medical profession, many of whom appear to have genuinely been convinced that the animals shown to them had actually escaped from the body. So many of these fables were obviously the outcome of gross superstition, hysteria, or of a deliberate intention to defraud that it is, perhaps, hardly surprising that modern writers on diseases of the digestive organs either ignore the subject altogether or merely mention the occasional occurrence of accidental parasitism. Nevertheless, instances are still recorded from time to time in which some unusual inhabitant of the human body has been observed by credible witnesses, and I have been able to collect more than one hundred and eighty cases in which lizards, frogs, tritons, slugs, caterpillars, worms, leeches, beetles, maggots, larvæ, or chrysalides were harboured in the digestive tract for a considerable time and accompanied by an intractable form of dyspepsia. Some of these are so well authenticated that the subject certainly seems to merit more attention than has hitherto been accorded to it.

(1) **Insects.**—A large number of different insects or their larvæ have been observed as accidental inhabitants of the human body and in the early part of last century, Hope published a list of some forty-three varieties that had been identified.

Since that time numerous additional cases have been recorded, and a careful perusal of the literature has enabled me to identify one hundred and thirty examples of genuine myiasis, or diseases caused by the presence of insects. In the vast majority, where sufficient details are given to permit of their identification, the insects belonged to three of the fifteen natural orders, namely, the Diptera, or two-winged flies, the Coleoptera, or beetles, and the Lepidoptera, or butterflies and moths, and it is with the various species

belonging to these three orders that the following remarks are chiefly concerned.

Diptera.—Of the numerous families of this order, the Muscidæ, which include the house-flies, blow-flies, flesh-flies, and flower-flies, contribute the greatest number of parasitic larvæ. The eggs of these insects are usually deposited in places where an abundance of food is obtainable without the necessity of exertion, and consequently the resultant larvæ constitute the lowest form of maggots and possess no legs. A very short time may intervene between the deposition of the egg and the appearance of the larva, which in the case of the blow-fly does not exceed twenty-four hours. As a rule, the common house-fly (Musca domestica) lays her eggs upon various forms of cooked meats, sweets, or biscuits, while the blue-bottle, or blow-fly (Musca vomitoria), prefers high meat, game, or other forms of animal food that are undergoing decomposition. In his description of the latter species, Wood remarks that the oval wire covers which are sold for the purpose of keeping blow-flies from meat are often useless, since, when the insect finds that she cannot gain direct access to the meat, she will rest upon the top of the cover and allow her eggs to drop through the mesh of the wire gauze. The flesh-fly, or Baker as it is often called (Musca carnaria), proceeds in a different and more expeditious manner. In the case of the blue-bottle and most other Muscidæ the eggs have to be hatched after their deposition, but in this species they are hatched within the body of the parent and are deposited as maggots, each female producing about twenty thousand. It was to such insects that Linnæus referred when he wrote the apparent paradox that three flies could eat an ox as fast as a lion. The flesh-fly does not even wait until the meat has undergone incipient decomposition, or, perhaps, is able to detect signs of it before they become apparent to the human senses, since hosts of these minute larvæ are

often found upon birds and animals within two hours of their death. Of the genus Anthomyia some species, such as the meat-fly (Musca anthomyia), particularly affect meat, while others feed on radishes or onions (A. ceparum), lettuces (A. lactucæ), or cabbage (A. brassicæ). Others, again, deposit their eggs in certain fruits, especially the raspberry and blackberry, each specimen of which when fully ripe may be found to contain a maggot. The number of eggs and larvæ which find entrance to the stomachs of persons who devour garden and hedge-row fruits must be enormous. In two apparently authentic cases (Lasalle, Sentex) larvæ belonging to the family of the Tipulidæ, or crane-flies, were detected in the vomit and fæces. The best known species is the Tipula longicornis, or daddy-long-legs, which deposits its eggs upon the ground whence they may possibly gain access to the human stomach through the medium of unwashed vegetables. The grubs, which are tough-skinned and hard-headed, are only too well known to gardeners by the name of leather-jackets. The larvæ of other species live in rain water in which they appear like minute pieces of scarlet thread that exhibit constant twisting movements. Occasionally the larvæ of the drone-fly (Eristalis tenax) find their way into the human stomach through the medium of water, although the muddy fluid usually favoured by these rat-tailed maggots can hardly be described as suitable for drinking purposes. Drosophila larvæ are sometimes ingested in sour milk (Hutton), and the well-known cheese mite (Piophila casei), which is probably quite harmless, needs no description. Another dipterous insect that lays her eggs upon the surface of water is the common gnat (Culex pipiens), and Allonneau has recorded an instance in which immense numbers of eggs and larvæ of this insect were vomited at intervals. The family of Œstridæ or botflies are parasitic in certain animals, the larvæ of the common botfly (Gasterophilus equi) infesting the stomach

of the horse. Several cases have been recorded in tropical countries in which persons vomited or evacuated larvæ of these species, while the one related by Cattle is of especial interest since it occurred in an inhabitant of this country who was not concerned in tending domestic animals.

Coleoptera.—At least twenty-four varieties of beetles or their larvæ have been identified in the vomit or evacuations of patients suffering from symptoms of gastrointestinal irritation, and more than forty instances may be found recorded in the literature. In the great majority the insects apparently belonged either to the Staphylinidæ, or rove beetles, the Carabidæ, or ground beetles, or to the Blaptidæ, among the latter of which the Blaps mortisaga, or churchyard beetle, is the most conspicuous example, its existence having been specifically mentioned in nine instances. In some cases many different species were found in the same individual mixed with larvæ of dipterous insects, spiders, millipedes, and entozoa. The eggs of many of these beetles are deposited in the earth, although those of Tenebrio molitor are usually found in corn mills and bakehouses and probably find their way into the stomach with the flour or bread. All the larvæ are of considerable size, those of the Blaps mortisaga often measuring an inch and a half in length, and as they are provided with very formidable feet and jaws, their existence in the stomach and intestines of their human host is usually productive of anything but comfort. If well supplied with food and warmth the Tenebrio molitor and perhaps other species breed throughout the entire year, a fact which may help to explain the persistent evacuation of the insects in all stages of their development, which was noted in the cases of Mary Riordan and others.

Lepidoptera.—Members of this order are less frequently parasitic in the human subject than the diptera or coleoptera. Caterpillars of the Noctuæ have been evacuated

alive in six instances, and in four others those of the Mamestra brassicæ, or cabbage moth, which infest the summer cabbage have been identified; while in one instance (Herold) the caterpillar of the large white butterfly (Pieris brassicæ) was found. In all, some twenty-two parasitic caterpillars, generally referred to as "hairy" or "smooth," have been observed, while Cavenne has recorded an instance in which chrysalides of butterflies were the cause of a severe gastroenteritis. Finally, it may be mentioned that Bartels has observed internal parasitism by a member of the family of the Pulicidæ, or fleas, and Ranque a case where numerous wood-lice were vomited.

Gastrointestinal infection by dipterous insects is far more common in tropical countries than in England, owing to the greater number and variety of flies and the habit of eating meat in a half-cooked state. Even in England, however, it is probable that the majority of people who enjoy cold game or stale cooked meats during the warm months of the year invariably swallow eggs and even larvæ of these insects, while those who indulge in garden fruits, raw cabbages, salads, onions, or radishes which have been carelessly cleaned are also extremely prone to infection by the various Anthomyia as well as by other insects that feed upon these substances. It is stated that the eggs of the blow-fly have been found in the evacuations of healthy individuals, and it is probable that if a systematic investigation were undertaken the eggs and larvæ of other genera would also be detected. The habit of drinking unboiled water or water that has been exposed to the air for some time is responsible for infection by those species that usually lay their eggs on water, while persons who drink the contents of pools, lakes, wells, or tanks invite infection by a vast number of larvæ. The fact that the rat-tailed grub of the drone-fly, which selects for its residence only the foulest water, has been found in the human stomach is sufficient to indicate how

widely opinions may differ concerning the exact definition of " drinking water." Cakes, biscuits, or sweets kept in cupboards are liable to be contaminated by many insects, and in the case related by Albrecht it was observed that the larvæ in the boy's stools were identical with those which infested a cupboard in which his favourite cakes were stored. A depraved appetite resulting from hysteria or mental disease seems to have been responsible for many examples of coleopterous larvæ in the human subject, although the fact that children are by no means exempt (Pickells) proves that accidental infection may sometimes occur, possibly through the medium of garden mould.

The clinical details of many of the cases of internal myiasis, while deficient in several important particulars, conclusively prove that under certain circumstances the eggs of insects are hatched in the human stomach and the resultant larvæ grow to their full size; while in rarer instances all the various metamorphoses which precede the development of the perfect insect may be completed in the organ. Thus, more than forty-five examples have been recorded where a vast number of maggots were evacuated as the result of the ingestion of insects' eggs and in many of these the length of time which elapsed between the probable date of infection and the first discharge of living larvæ corresponded with that required for the hatching of the eggs and the development of the maggots. In other instances, again, as in that related by Cavenne, the appearance in the stools of chrysalides suggests that the pupal as well as the larval stage was completed in the alimentary tract, while the case of Mary Riordan and others in which larvæ, pupæ, and perfect insects were discharged at intervals for years can only be explained by the assumption that the insects actually multiplied in the digestive canal of their host. These clinical observations are to some extent confirmed by the results of experiment. Thus, the larvæ of flies intro-

duced into the stomachs of guinea-pigs and frogs have been found alive at the expiration of three days, and those of the blow-fly not only withstand prolonged immersion in water but resist artificial peptic and pancreatic digestion for six or seven hours. The extraordinary vitality of many species of beetles, especially the Blaptidæ, has frequently excited comment (Pickells) and even immersion in spirits of wine for several hours does not seem to affect the Blaps mortisaga (Wood).

It is quite certain, therefore, that not only do the eggs of dipterous and coleopterous insects frequently hatch in the human stomach, but that the larvæ may remain alive in the organ sufficiently long to permit their escape into the more hospitable regions of the intestine. If these statements apply to the normal stomach they become infinitely more forcible when the frequent occurrence of gastric subacidity is considered. It is well known that certain functional disorders of the nervous system, including neurasthenia, hysteria, and some forms of insanity, are not infrequently accompanied by a marked deficiency of hydrochloric acid in the gastric secretion, and since all varieties of primary inflammation of the stomach induce a similar diminution of digestive activity, it is obvious that the gastritis which ensues from the presence of living animals must indirectly favour their longevity. It is also highly probable that the condition known as achylia gastrica, in which the stomach never secretes any acid, is far more common than is usually supposed, and consequently in many apparently healthy individuals the stomach will act merely as an incubator which presents every convenience for the development of any eggs that may happen to gain entrance to it.

Symptoms.—The symptoms that ensue from the presence of larvæ in the alimentary tract vary according to the numbers and nature of the parasite. In the case of the

Muscidæ the passage of maggots by the rectum is often the first indication of the disease; but when larvæ of the Œstridæ, Tipulidæ, or Coleoptera are present, their large size and sharp appendages always give rise to considerable irritation. An interval of four to twelve days usually intervenes between the ingestion of the insect's eggs and the appearance of the first symptoms, during which time the patient either feels perfectly well or complains of vague abdominal discomfort, restlessness, and want of appetite. At the end of this incubation period, general malaise is usually experienced accompanied by headache, thirst, anorexia, and faintness, while in children rigors, convulsions, and delirium are not infrequent. Extreme vertigo has been mentioned in so many cases that its occurrence cannot be regarded as purely accidental. Fever occurs in more than half the cases and may persist for ten days or longer, although, as a rule, it tends to subside within forty-eight hours; in several instances continued pyrexia for three weeks accompanied by looseness of the bowels caused the case to be diagnosed as one of enteric fever (May). When dipterous larvæ inhabit the intestine the abdominal symptoms are usually slight and consist chiefly of distention, uneasiness, or of pinching and pricking sensations in the region of the navel; but if those of beetles, botflies, or craneflies are present, severe tearing or gnawing pains are often complained of, or genuine colic is experienced. Retching and vomiting occur in the majority of cases where these latter larvæ exist, and in more than one instance hæmatemesis has been observed. The crisis of the complaint, which seems to coincide with maturity of the larvæ, is heralded by the sudden evacuation of the parasites, dipterous maggots being usually discharged by the bowel as well as from the stomach, while beetle-larvæ are more often vomited. Occasionally only a few are eliminated at a time, but, as a rule, their numbers have been reckoned by the pint, quart, or

litre, or were described as innumerable. It is interesting to notice that young children often suffer from general urticaria, especially when the caterpillars of certain moths have been swallowed. The evacuation of the maggots is almost invariably accompanied by a rapid subsidence of all the former symptoms, with the exception of a mild form of diarrhœa which may persist for several days. In nearly two-thirds of the recorded cases the symptoms recurred within fourteen days, and in about 40 per cent. of the entire number the patients continued to discharge larvæ either from the stomach or the bowel for many months. In one case that came under my care large numbers of maggots had been discharged from the bowels every autumn for several consecutive years, and on two occasions had been associated with hæmaturia. The lady had mentioned her distressing complaint to a doctor, but being too timid to exhibit the maggots the matter had apparently been regarded as imaginary. When I examined her in her fifth attack the living larvæ in the motions were undoubtedly those of the blow-fly (M. vomitoria) and the secretion of the stomach was deficient in hydrochloric acid. In only two instances was any mention made of the appearance of the fly in the stools or vomit, so it is probable that the apparent chronicity of the disease depended upon a succession of distinct infections; but in the cases of coleopterous parasitism, such as those recorded by Pickells, Ariel, Patterson, Bateman, and others, the long continuance of the disease, which in Pickells' patient was still increasing in severity after three years, indicates that the insects must have multiplied within the body of their host. Senator's case is of interest from the fact that while no maggots could be obtained by washing out the stomach, the patient vomited twelve more about a month later. In only one instance was external myiasis associated with discharge of larvæ from the bowel. This was observed by Pout in 1787 and

concerned a girl eleven years of age who was suffering from smallpox. On the ninth day of the disease she suddenly passed about half a pint of live maggots, and in all about three quarts were discharged from the bowel. As the pustules burst each one was found to contain a similar maggot. Death occurred from exhaustion. The medical attendant appears to have been so surprised and perplexed by these curious features of smallpox that it is hardly possible to regard the case as anything but genuine. Emaciation, anæmia, and general debility are usually observed in chronic cases, and occasionally mention has been made of a depraved appetite, difficulty of micturition, dyspnœa, and dropsical effusions. The general features presented by beetle parasitism are well exemplified by the case of Mary Riordan which excited much interest during the third decade of last century and was so carefully watched by many independent observers for the space of three years that even Cobbold admitted its genuineness. This young woman, who was highly neurotic and steeped in superstition, made it a practice for two years to remove clay from the graves of some priests of extreme sanctity and to mix it with her daily food. When first seen by Pickells she complained of severe gnawing and cramping pains in the abdomen, nausea, giddiness, and retching and was subject to attacks of catalepsy. At intervals violent vomiting would occur attended by the ejection of various larvæ mixed with blood and mucus. In these attacks the patient would scream with pain and describe herself as suffering the tortures of hell, or even exhibit epileptic convulsions. During the first year of her illness seven hundred larvæ, most of them alive, were vomited and about one hundred passed per rectum; while in the course of the next eighteen months nearly thirteen hundred were counted. Most of the larvæ were identified as those of the Blaps mortisaga, or churchyard beetle, but in addition to these the meal-worm, or larva of the Tenebrio molitor,

various dipterous maggots, and intestinal parasites were observed. The majority of the larvæ were full-grown, those of the Blaps mortisaga measuring 1½ inches in length and being apparently omnivorous, since they frequently devoured each other when kept in boxes for observation. Pupæ, as well as perfect insects were often seen, and on one occasion when two beetles were vomited the insects flew away. For three and a quarter years these parasites continued to increase in numbers, and the patient remained extremely ill and suffered from dropsy, retention of urine, and other notable symptoms. After numerous remedies had been tried, the administration of 6 ozs. of turpentine each day procured the evacuation of immense numbers of larvæ, pupæ, insects, and worms, after which the pain and vomiting subsided and the girl was restored to health. In Ariel's case the patient vomited immense numbers of beetles during the course of two years, including two hundred and sixty-three belonging to various species of Staphylinidæ, among which were identified the Ocypus olens, or devil's coach-horse, as well as numberless larvæ of the Tenebrio molitor and of different species of Carabidæ. This patient was cured by a mixture of turpentine and linseed oil. Osiander's case, to which reference has already been made, vomited and passed by the bowel numerous millipedes, flies, larvæ, beetles, spiders, and worms. Colter mentions a kaffir girl, eighteen years of age, who, after suffering for a long time from abdominal pains, vertigo, and loss of flesh, vomited every few days a specimen of the "dunghill-beetle"; while in the cases recorded by Jessop, Rosenstein, and others living larvæ of various beetles were either vomited or evacuated. Very little is known concerning the symptoms produced by the Lepidoptera, most writers being content to refer those exhibited by their respective cases to gastritis or enteritis. In one described by Waters a child was seized with high fever, delirium, general urticaria, and indications

of acute gastritis, all of which subsided after a hairy caterpillar 1½ inches in length had been expelled from the bowel.

Treatment.—Accidental parasitism would probably be prevented if sufficient care were taken to prevent the access of flies to meat and other articles of food during the summer and to avoid uncooked vegetables, musty cakes and biscuits, and unboiled water. Muslin safes are alone of any value in protecting meat from blow-flies. In mild cases of internal myiasis a sharp purge is sufficient to rid the intestines of the larvæ and eggs, while in the more troublesome forms the administration of thymol, santonine, or other anthelmintic often appears to be successful. Beetles are, however, notoriously difficult to kill, and it was only by enormous doses of turpentine that Pickells and Ariel were able to rid their patients of these pests.

Slugs.—The garden slug has long been credited with the power of living in the human stomach for a considerable time (Trümpy). Most of the cases, however, which are supposed to support this contention are extremely doubtful, although the following instance reported by Dickman in 1859 presents certain features of interest. The patient was a girl twelve years old who was in the habit of devouring raw vegetables in the garden. For two months she had complained of nausea and discomfort after meals, and on August 5th vomited a large, active garden slug. The following day two more were vomited, and on the seventh no fewer than five of various sizes. On the ninth she suddenly exclaimed that something was crawling up her throat and was seized with violent retching and choking, at the same time making desperate efforts to extract the animal with her fingers. A mixture of ammonia and camphor gave immediate relief, and after free purgation the symptoms disappeared. Three of the slugs were preserved and it was noted that for a time they ate cooked vegetables. Dickman considered that the girl had probably swallowed

the slugs when they were extremely small. In 1865 Dalton discussed the question whether slugs could live in the stomach in the light of certain experiments. He stated that when small slugs were carefully introduced into the stomachs of dogs they were always found to be dead when the animal was killed after a short interval, and that if kept in water at a temperature of 70° F. they invariably succumbed within twenty-four hours. My own observations indicate that garden slugs rapidly die in water at the temperature of the human body, although they are capable of living in a moist atmosphere at 100° F. for several hours. On the other hand, immersion in the filtered contents of a healthy human stomach which possesses the normal degree of acidity is attended by an immediate coagulation of their mucilaginous covering and death within a few minutes. It can only be assumed, therefore, that if Dickman's observations were correct his patient either possessed a stomach which secreted no acid or that the slugs had never penetrated lower than the œsophagus. Rhind's case, in which a common grey slug, 4 inches in length, is stated to have lived in the stomach for eighteen months and to have survived five days after it was vomited, appears to have been similar to many others where hysterical women added slugs to vomit with the intention of exciting interest or compassion.

Lizards.—In 1834 Luroth published the case of a woman twenty-eight years of age, who, after suffering for a long time from gastralgia and other symptoms of indigestion, was attacked with severe colic and voided a lizard 3 inches in length, after which all her former symptoms disappeared. In David's case the patient, who was sixty years of age, was cured of severe gastritis after vomiting a lizard, while in that related by Spence the reptile voided by the bowel was sufficiently agile to escape capture. In these as well as in other instances (Bernstein, Pingault, Hirzl) the sole evidence appears to have rested upon the statements of the

patient, and the evacuation of the animal does not seem to have been observed by any independent witness. There is consequently no reason to suppose that the lizards ever inhabited the alimentary canal.

Worms.—Garden worms are frequently brought to medical men with the story that they had been vomited or evacuated by the bowel. Several instances have been recorded (Eyting, Fermaud, Sutton) in which the ingestion of such worms was followed by severe inflammation of the stomach and intestines, but there is no evidence that they remained alive in the digestive tract for any length of time.

Leeches.—In former years when leeches were constantly employed in medical practice, many instances were recorded in which they were accidentally swallowed with serious results, and in a medical treatise published in 1835 it is stated that when leeches gain access to the human stomach they grow to an immense size and occasion severe losses of blood. Spence claimed to have removed from the throat of a patient a leech which had caused spitting of blood for two months. Dumas relates an example of acute gastritis due to a leech in the stomach; Marques, one in which repeated hæmatemesis occurred during the course of twenty-two days from the same cause, and Wanderbach a somewhat similar instance. There does not appear to be any reason why a leech should not enjoy a comfortable existence in the human stomach, but whether it would be capable of sucking blood from its host for an indefinite period is open to question. It is comforting, however, to know that the administration of a strong solution of common salt is a certain method of destroying such unwelcome parasites.

Amphibious Animals.—The popular belief that the stomach always contains fluid may possibly account for the superstition that certain amphibia, such as frogs and salamanders, are able to pass a prolonged existence in the

human body. At least four cases have been recorded in which the presence of living frogs appears to have been honestly regarded by doctors as the cause of the gastric symptoms presented by their patients (Ille, Sander, v. Wiebers, Weis). In two instances only one frog seems to have existed, while Sander's case was remarkable from the fact that no fewer than nine frogs were vomited. In every instance the patient was a woman who had experienced colicky pains, flatulence, nausea, and loss of flesh for some time previous to the appearance of the animal in the vomit. Aquatic salamanders, as occasional inhabitants of the human body, have been recorded by Linckius and others, but in every case it would seem that the reptile had been intentionally swallowed. Berthold carefully investigated the question of living amphibia in the human stomach, and in two instances he was able to demonstrate the existence of flies and other insects in the stomachs of reptiles which were stated to have been vomited after a long residence in the patient's body; while a salamander, supposed to have been vomited by a girl, died when placed in water at a temperature of 65° F. This observer also noted that frog-spawn, tadpoles, edible frogs, and salamanders rapidly die when the temperature of the water in which they lived was raised above 65° F. On the other hand, at least two cases have been recorded which go to prove that amphibia are able to resist a much higher temperature than Berthold was inclined to admit. Thus, an insane woman under the care of Bresmer, believing that the reptile's bite was fatal, attempted to commit suicide by swallowing a small toad which she had carefully wrapped up in a piece of peritoneum obtained from a butcher's shop. No symptoms of interest developed for several hours, but in the course of the evening she complained of much nausea and oppression at the chest and finally vomited the toad, alive but with both its hind legs broken. Colin's patient, who swallowed

a live aquatic salamander, vomited the animal alive after the lapse of sixty hours. With regard to the question of food it is probable that the smaller amphibia and reptilia are able to accommodate themselves to existing circumstances to a much greater degree than is usually believed; and I have seen lizards, when deprived of their natural food during the winter, learn to drink milk and thrive upon this novel diet. Although there is no reason to believe that amphibia ever enjoy a prolonged existence in the human stomach or that spawn accidentally swallowed can develop into tadpoles, it does not seem improbable that a small frog if uninjured in transit might live in the stomach for several hours.

With regard to the cases in which live fresh-water shrimps are stated to have been discovered in the evacuations (Banon, Troschel, Wright), I have never observed these Crustacea live more than fifteen seconds in water at the temperature of the human body.

Snakes.—The only carefully attested instance of a snake living more than a few hours after being swallowed is that recorded by Mandt. The subject of this incident was a Russian peasant, thirty-six years of age, who, when sleeping in a forest, was awakened by a sensation of something passing down his throat. On examination, a rounded body endowed with spontaneous movement could be felt, which also produced a loud bruit that was audible through a stethoscope. Various emetics and aperients were given, but the movements did not cease until the third day. Nearly a fortnight later a dead and partially digested viper measuring rather more than twelve inches in length was expelled by the bowel. The reptile was identified as belonging to a species the bite of which excited inflammation but was not fatal.

CHAPTER VIII

DYSPEPSIA IN INFANCY AND OLD AGE

Disorders of digestion are exceptionally common at the extremes of life. The stomach of the new-born infant is an organ of such limited capacity and of so little physiological importance that the processes of digestion and absorption are carried out almost entirely by the intestines. It consequently happens that if the intestinal functions become deranged from any cause the bowel symptoms take precedence of those arising from the coexisting disorder of the stomach, and in many instances completely mask them. It is only after the completion of the first dentition that the intestine becomes gradually replaced by the stomach as the predominant factor in the maintenance of the nutrition.

About the age of fifty-five an increased liability to certain forms of dyspepsia once more manifests itself, and the complaint, when once established, usually proves very intractable and not infrequently endures for the rest of life. The remarkable failure of digestion exhibited by some elderly people is sometimes due to degenerative changes in the tissues of the stomach and bowel, and sometimes to the various diseases of other important organs of the body which are particularly apt to develop after middle life. The former comprise atrophy of the mucous membrane in the pyloric region, atony and ectasia of the gastrointestinal tract, and a gradual diminution of its digestive and absorptive powers; while among the latter, diseases of the heart,

emphysema of the lungs, arteriosclerosis and chronic diseases of the kidneys exert the most deleterious influence upon the digestive system.

The period of *puberty* is sometimes accompanied by functional derangements of the stomach, the rapid growth of the body in boys being occasionally attended by atony of the digestive organs or by neurasthenia gastrica, while in girls, the establishment of the catamenia is often associated with anæmia and its attendant troubles of hyperchlorhydria and gastric hyperæsthesia. Many women also suffer from troublesome indigestion at the *climacteric*, as the result either of excessive loss of blood or of the profound nervous disturbance which occurs at that time. In these latter cases, however, the resultant dyspepsias differ in no way from similar disorders met with at other periods of adult life, and therefore require no additional description.

(1) THE CHRONIC GASTROENTERITIS OF INFANCY

(Chronic Inflammatory Diarrhœa—Marasmus—Infantile Atrophy)

Many terms have been employed at different times to describe a chronic disease of infancy characterized by vomiting, diarrhœa, or some other symptom of disordered digestion, and attended by gradual wasting of the tissues of the body. As a rule, the choice of nomenclature has been determined by the predominance of some particular symptom of the complaint, so that we find such apparently diverse terms as "chronic vomiting," "inflammatory diarrhœa," "athrepsia," and "marasmus," applied to the same disease, according as one or other of its symptoms happens to be most prominent. But however widely the various cases may differ among themselves in their clinical aspect, they all present one common feature after death, for in every instance the signs of chronic inflammation of

the stomach and intestines, with more or less atrophy of the mucous membrane of the alimentary canal, can be demonstrated by the microscope. It appears, therefore, to be justifiable, as well as expedient, to group all the cases which exhibit this primary lesion into one class, and to designate the disease "chronic gastroenteritis."

Etiology.—Chronic catarrh of the stomach and intestine is predisposed to by the same conditions which render children vulnerable to the acute form of the disease. Thus, congenital syphilis, rickets, tuberculosis, anæmia, and malnutrition, all favour the chronicity of the digestive disorder when once it has been excited; while overcrowding, defective ventilation, deficient or deleterious foods, or a previous attack of intestinal catarrh eminently predispose to the acquisition of the more enduring form. Among the exciting causes of the disease, the habitual administration of unsuitable food, exposure to cold, or an attack of an acute specific fever are of the first importance. Chronic gastroenteritis in infancy must consequently be regarded as essentially a preventable disease, inasmuch as the chief factors in its causation consist of habitual neglect either of the elementary laws which should govern the diet and hygiene of early life or of those minor disorders of digestion which usually precede the development of the complaint. With these facts in mind, it is hardly a matter for wonder that the disease is so disproportionately common among the poor inhabitants of large cities, whose children are exposed not only to the dangers arising from insufficient nourishment, but also to those engendered by the ignorant and superstitious practices current among uneducated persons. Such people invariably cherish the delusion that palatable substances and food are synonymous terms, and it is impossible to convince them that the mere introduction of food into the stomach is quite valueless for the purposes of

nutrition, unless the infant is capable of digesting and assimilating it.

Among 1,000 consecutive cases of disease in children which came under my notice at the Evelina Hospital, 172, or 17·2 per cent., were found to be suffering from gastroenteritis, the symptoms of which had existed for more than a month. From this number I have taken, without selection, the notes of 100 cases of the disease, and upon an analysis of these the following remarks are based. In only eight instances out of the entire number were the infants fed entirely upon the breast, the remaining ninety-two receiving either cow's milk or some kind of farinaceous food. These figures emphasize in a striking manner the influence of diet in the causation of the disease. In eleven cases the complaint was stated to have followed immediately upon an attack of some specific fever, of which pertussis, measles, and scarlatina were the most important. Upon this point the observations of Rilliet and Barthez are noteworthy, since they show that, among 140 cases of chronic diarrhœa in children, twenty-seven were preceded by pneumonia, thirty-seven by measles, seventeen by smallpox, scarlatina, or enteric fever, and twenty-nine by either angina, pleurisy, bronchitis, or croup. With regard to the importance of exposure to cold as an exciting cause of the disease, I can offer no reliable statistics, since in out-patient practice it is impossible to discriminate between the influence of atmospheric conditions and the effects of those dietetic errors which constitute such an extremely common and important factor in the production of all diseases of infancy. There can be no doubt, however, that an attack of acute gastric or intestinal catarrh can be excited in the first instance by exposure to cold, and afterward converted into the subacute or chronic form by the influence of one of the above-mentioned causes. The various ages at which chronic gastrointestinal catarrh is most commonly contracted is a matter of some importance, and

the cases at my disposal allow of arrangement in the following manner :

Age of infant at commencement of disease	No of cases	Breast-fed	Breast and artificial foods	Artificial foods only
1– 4 months	34	1	1	32
4– 8 ,,	10	1	7	2
8–12 ,,	17	3	4	10
12–18 ,,	26	2	0	24
18–24 ,,	13	1	0	12
	100	8	12	80

These figures present several points of interest. It will be seen at once that the disease is most common within the first four months of life, since no less than 34 per cent. of the cases occurred in infants of this age. During the next four months the cases only represent 10 per cent. of the entire number; but from the eighth to the eighteenth month the susceptibility to the disease appears to increase, for we find that 43 per cent. of all the cases which came under observation were infants between eight and eighteen months old. After the eighteenth month the complaint becomes comparatively rare, and is seldom encountered after the third year of life. This curious fluctuation in the incidence of the disease at different periods of infantile life can only be explained by an examination of the kinds of food which were employed in the various cases prior to the onset of the inflammatory complaint. Thus, among the thirty-four cases occurring in children less than four months old, thirty-three, or 97 per cent., were habitually supplied with some form of artificial food, and only in one instance was the child fed exclusively upon the breast. In every instance the infant had appeared to be perfectly healthy at birth, but within a short time had commenced to exhibit the symptoms of chronic dyspepsia or to suffer from attacks of subacute catarrh of the stomach and intestine, accom-

panied by gradual wasting of the tissues of the body. It is probable, therefore, that the chief cause of chronic gastro-intestinal catarrh at this period is to be found in the injudicious administration of artificial foods in lieu of the maternal milk.

The comparative immunity from the disease which is apparent between the fourth and ninth months of life is probably due to the fact that at this period the majority of the children are either nourished entirely upon the breast, or, having escaped the initial dangers of artificial feeding, are able to take the bottle with impunity. But about the ninth month the common custom of supplementing the breast milk with biscuits, cornflour, or some other variety of farinaceous food at once exposes the infant to the dangers arising from the administration of artificial foods, and consequently the disease once more becomes prevalent until the time when milk is finally discarded for the mixed diet of adult life. Among the wealthier classes, on the other hand, mothers who nurse their children are in the habit of employing some form of artificial food about the fourth month, so that, had these statistics been compiled from observations made in private practice, it is probable that the disease would have appeared to be more rife within the first six months than at any other time.

Morbid Anatomy.—As in the case of every other disease of the digestive canal, the naked-eye appearances presented by the tissues after death are usually quite insignificant when contrasted with the violence of the symptoms observed during life. The stomach and small intestine are usually somewhat distended with gas, and occasionally the transverse colon and sigmoid flexure are also much inflated. The stomach invariably shows signs of dilatation, the exact degree of enlargement varying directly with the duration of the disease and the severity of the organic changes which have occurred in the coats of the organ. As a rule, the

lower border of the viscus seldom extends more than a finger's breadth below the level of the umbilicus, the enormous dilatation which so often accompanies the chronic gastric catarrh of pulmonary tuberculosis being never observed. When the stomach of an infant becomes dilated owing to weakness of its muscular walls, the shape it assumes differs from that which is observed under similar conditions in adult life. In the majority of cases, it still maintains its cylindrical form, owing to the cardiac and pyloric portions of the organ participating equally in the dilatation. Occasionally, however, the fundus is greatly distended, while the pyloric region still preserves its natural contour, and in such cases the lower end of the œsophagus is usually dilated, and appears to pass imperceptibly into the upper border of the stomach. Some writers have described a form of hour-glass dilatation of the stomach in infancy, but this variety I have never observed. In all cases where the stomach is dilated, the increased weight of the organ drags the pylorus downward and inward toward the median line of the abdomen, thereby causing it to describe an arc of a circle, the centre of which is situated at the œsophageal opening of the diaphragm.

Upon opening the organ and removing the thick layer of mucus which adheres to its inner surface, the mucous membrane is found to present a dead white, opaque appearance, and to be more firmly adherent to the subjacent layers of tissue than under normal circumstances. Post-mortem digestion is rarely encountered. In long-standing cases, where the body has undergone great emaciation, the coats of the stomach and intestines are sometimes so extremely thin and transparent as to resemble tissue-paper. Vascular injection is usually absent, but should an attack of subacute catarrh have occurred shortly before death, the surface may exhibit a patchy or arborescent form of congestion. In very chronic cases the mucous membrane in the pyloric

region sometimes presents a rudimentary form of mammillation, being mapped out into small polygonal areas of thickened and opaque tissue. In other instances, the secretory membrane exhibits a brownish or slate-coloured tinge as a result of chronic congestion, or minute extravasations of blood may be observed in the cardiac region of the organ or in the vicinity of the lesser curvature. Hæmorrhagic erosions are also frequently encountered in the cardiac extremity of the stomach, but the follicular form of ulceration due to disease of the solitary glands is rare, unless the primary complaint has been complicated with tuberculosis. Parrot and other writers have described aphthous patches upon the mucous membrane similar to those which occur in the mouth, as well as the occasional formation of a false membrane like that observed in cases of diphtheria of the stomach. The former condition is, however, extremely rare; the latter I have never seen in cases of simple chronic gastritis.

The small intestine seldom exhibits any more decided appearances of disease than those already noted. The Peyer's patches are apt to be enlarged in the early stages of the complaint, and often present signs of congestion or even minute hæmorrhages. Ulceration seldom occurs, but as the disease progresses an atrophy of the lymphoid tissue takes place. The lower portion of the ileum, within an inch or two of the ileo-cæcal valve, is occasionally the seat of an irregular form of ulceration, superficial in character, and not infrequently multiple. The mucous membrane in the immediate neighbourhood of the disease is thickened and pigmented from chronic inflammation.

In all cases of chronic enteritis, the most characteristic phenomena are to be found in the large bowel, especially near its lower end. Here thickening and adhesion of the mucous membrane to the muscular coat is the rule, and in most cases the superficial aspect of the inner coat presents

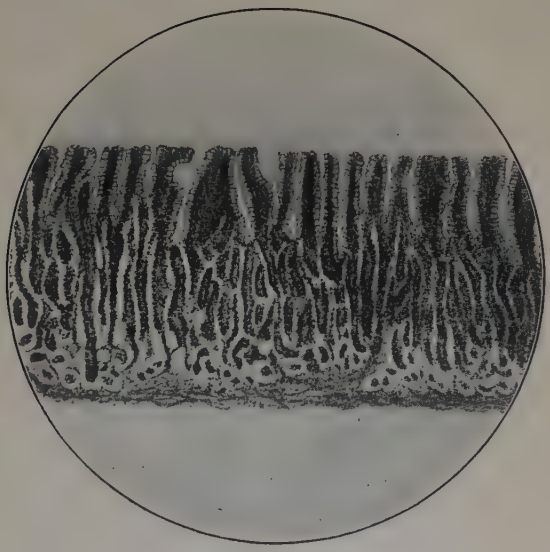

FIG. 9.—Section of a Normal Infant's Stomach. (× 80.)

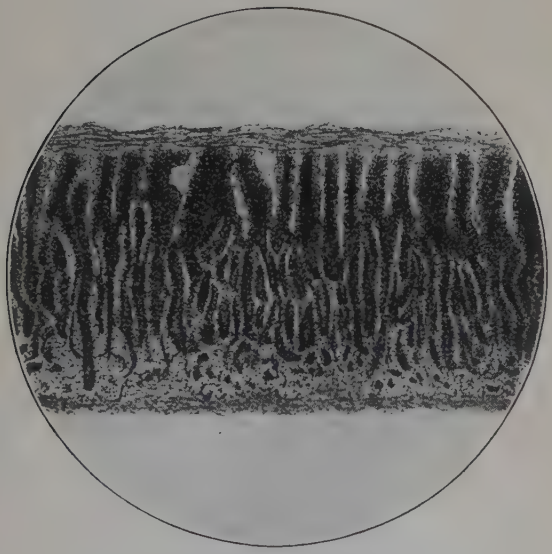

FIG. 10.—Section of the Stomach in an Early Case of Gastroenteritis, showing the Infiltration of Round Cells between the Glands of the Mucous Membrane (first stage of the disease). (× 80.)

a mottled appearance, owing to an immense number of minute points of pigmentation. In the transverse colon and cæcum this feature is sometimes so marked that areas of the mucous membrane several inches in extent exhibit a uniform slate-coloured tinge. This condition is quite distinct from the superficial staining which results from the long-continued use of bismuth or arsenic. In about 62 per cent. of the cases where the disease has existed for more than four weeks, the large intestine is affected with follicular ulceration, the severity of which varies with the degree and duration of the inflammatory process. In mild cases, the inner surface of the colon and rectum exhibits numerous small pits, separated from one another by patches of congested tissue, while in more severe instances, necrosis of the solitary follicles occurs, and gives rise to definite circular ulcers, which coalesce and ultimately involve a considerable area of the mucous membrane. These ulcers usually have their bases situated in the submucous coat, but occasionally they penetrate deeply into the muscular tunic, and may even lay bare the serous covering of the bowel. In very chronic cases the inner surface of the colon, sigmoid flexure, and rectum may be completely honeycombed by the ulcerative process, the only remnants of mucous membrane consisting of a network of indurated and discoloured tissue which serves to separate the various ulcers from one another. As a rule, the lower end of the large intestine suffers more severely than the upper portion, while in some cases the rectum is the only part of the bowel affected by ulceration.

Morbid Histology.—The earliest description of the histological appearances presented by the stomach and intestines in cases of "infantile atrophy" is to be found in the writings of Parrot, who recognized the signs of chronic inflammation in many of the specimens which he examined with the microscope. Since these observations were published, the subject

has attracted comparatively little attention, and most writers, while they admit the presence of chronic gastro-enteritis, appear to attach but little importance to the organic changes induced in the digestive tissues by the inflammatory disease. Several years ago, being then unaware of Parrot's monograph on Athrepsia, I commenced a systematic examination of the digestive organs of children dying from different forms of disease. Among these were sixteen cases of infants who had succumbed to progressive emaciation, and in whom post-mortem examination threw no light whatever upon the cause of the fatal symptoms. But in every instance the microscope demonstrated the presence of organic changes of an important nature in the alimentary tract, and it is chiefly from these cases that the following remarks concerning the morbid histology of the disease have been compiled.

The Stomach.—The first sign of disease in the stomach consists of an infiltration of round cells into the interstitial connective tissue of the mucous membrane similar to that already described in cases of acute gastritis. The chief seat of the mischief is situated between the ducts of the gastric glands just beneath the superficial epithelium, the columnar cells of which are either detached or converted into goblet cells. As the disease progresses, the inflammatory process extends in the direction of the muscularis mucosæ, so that eventually the whole of the tissue between the glands becomes densely packed with deeply staining nuclei, among which the original connective-tissue elements can often be discerned in a state of active proliferation.

The engorgement of the capillary vessels which ramify in the mucous membrane increases the pressure already exerted upon the tubules, so that the latter become displaced and their outlines obscured. The solitary lymphatic glands also undergo an increase in size owing to the proliferation of

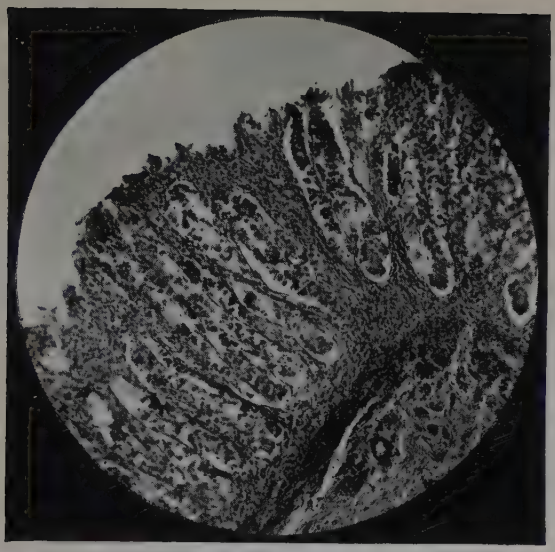

FIG. 11.—Photomicrograph of the Stomach in a Case of Chronic Gastro-enteritis, showing the Formation of Fibrous Tissue between the Gastric Glands (second stage of the disease). (× 80.)

FIG. 12.—Photomicrograph of the Stomach in a Case of Chronic Gastro-enteritis, showing Cirrhosis of the Mucous Membrane, with Complete Atrophy of the Gastric Glands (third stage of the disease). (× 80.)

their cellular elements, and tend to encroach upon the free surface of the mucous membrane.

The second stage of the process is marked by the gradual organization of the inflammatory products. The superficial epithelium is now completely detached, and the surface of the section exhibits a jagged and uneven appearance owing to the irregular contraction of the newly formed fibrous tissue. Instead of pursuing a course perpendicular to the surface, the ducts of the glands are seen to be twisted and distorted by the pressure exercised upon them, while their lumina are often choked with mucus, detached cells, and epithelial débris. The tubular glands themselves are separated from one another by strands of fibrous tissue, the thickness of which varies at different spots. The basement membrane of the glands is thickened, and the secretory epithelium undergoes a series of changes as a result of interference with its nutrition. In the cardiac two-thirds of the stomach, where the tubular glands are straight and comparatively short, the peptic cells usually proliferate at first, and entirely block the lumen of the gland. Subsequently they undergo fatty degeneration, so that eventually it is impossible to distinguish the outlines of the various cells amongst the mass of fatty and granular material which fills the greater portion of the tubule. In the pyloric region of the organ, on the other hand, where the gastric glands are of much greater length, and usually convoluted, the first effect of the contraction of the interstitial connective tissue is to constrict some portion of the tubule, and thus to impede the evacuation of its secretion. As the result of this, the lower end of the gland becomes dilated, while its epithelium loses its characteristic features and is gradually flattened against the basement membrane. In this manner a retention cyst is formed in the substance of the mucous membrane, which eventually becomes lined with a single layer of cubical epithelium. In certain sections, the soli-

tary glands may be observed to have discharged their contents into the cavity of the stomach with the production of follicular ulcers, while here and there a small hæmorrhage or minute erosion may be discerned upon the surface of the mucous membrane. These latter appearances are, however, merely accidental, and are devoid of any special significance.

At this period of the disease the submucous coat of the organ often participates in the inflammatory condition, and presents a general engorgement of its blood-vessels, with a considerable increase in the number of nuclei scattered through its tissue. The muscularis mucosæ is also infiltrated by small round cells, and in many places the contractile fibres show signs of compression by newly formed fibrous elements. The muscular coat of the organ seldom exhibits any morbid phenomena beyond extreme engorgement of its vessels and an increase in the number of nuclei situated in its interstitial connective tissue.

The third and last stage of the inflammatory process is characterized by complete cirrhosis of the mucous membrane, with secondary changes in the other coats of the stomach. In many cases the surface of the section has a peculiar papillary or villous appearance, which at first glance may cause the tissue to be mistaken for the small intestine. These spurious villi are due to the accumulation of the products of inflammation between the mouths of the ducts, and consist of round and spindle cells with capillary vessels of new formation. The gradual contraction of the new fibrous tissue in the substance of the mucous membrane has given rise to atrophy of the gastric glands, so that the greater part of the section appears to be composed of fibrous elements among which are scattered the remains of the tubules, the cells of which are usually in an advanced state of fatty degeneration. The cirrhotic tissue is extremely vascular, and when artificially injected exhibits numerous

newly formed vessels. It is probably on this account that the atrophic mucous membrane presents so little deviation from the normal when viewed by the naked eye. At this stage of the complaint the muscularis mucosæ is more or less completely destroyed, and the few strands of muscular fibre which remain appear to be embedded in a mass of fibrous tissue, and present signs of fatty degeneration. The submucous coat is much thickened and condensed by the organization of the inflammatory products effused into its connective tissue, while the arterioles which pass obliquely upward to supply the mucous membrane exhibit sclerotic changes in their inner and middle tunics, and are not infrequently filled with thrombi. The muscular coat is often closely intersected by bands of fibrous tissue, and the contractile fibres appear granular or fatty. In very chronic cases the wall of the organ may be reduced to almost one-half of its normal thickness. Although the whole of the stomach is usually involved in the inflammatory process, the disease is found to vary in severity at different spots. As a rule, its effects are most noticeable in the region of the lesser curvature, where the cirrhotic changes may give rise to an appearance of superficial scarring. In other parts of the organ the disease exhibits a more irregular distribution, so that it may often be observed that, while at one spot the mucous membrane is already in an advanced state of cirrhosis, at another in the immediate neighbourhood the inflammatory disease has only attained the second stage. These facts will be referred to later, when the question of recovery is discussed.

The Small Intestine.—The small intestine presents the same general appearances as have already been described in the case of the stomach. The vascular injection which accompanies the first stage of the disease is associated with an infiltration of small round cells into the interstitial connective tissue of the villi, and into that which separates the

glands of Lieberkühn from one another. When organization of the exudation takes place, the contraction of the fibrous tissue obliterates the glandular structures, so that in severe cases the mucous membrane becomes more or less completely cirrhosed (Fig. 13).

At an early period in the disease the columnar epithelium which normally covers the surface of the bowel is detached, and many of the villi become adherent to one another as a result of the inflammation of their structure. Thus, in some sections, the surface of the mucous membrane presents a series of hoops or arches, owing to the adhesion of the villi at their free extremities, while in others the distinctive features of the tissue are obliterated through agglutination of the contiguous villi by their lateral margins. In many cases the epithelium of the tubular glands desquamates, and the ducts become blocked by masses of granular or fatty material; but in others the cells of Lieberkühn's glands preserve their normal appearance throughout. As soon as the contraction of the interstitial tissue exerts pressure upon the ducts, the tubules commence to dilate and are eventually converted into small retention cysts, similar in structure to those already described in the case of the stomach. Brunner's glands, on the other hand, appear for the most part to escape the results of retention of secretion, but fatty degeneration of the epithelium of these convoluted tubules is frequently observed before the disease in the mucous membrane has advanced beyond the initial stage. At a later period of the complaint, when considerable induration of the mucous and submucous coats has taken place, the basement membrane of Brunner's glands, as well as the connective tissue between them, becomes remarkably thickened, and the secretory epithelium degenerates and is detached.

The Large Intestine.—In the large intestine the chief signs of disease are to be found in the transverse and de-

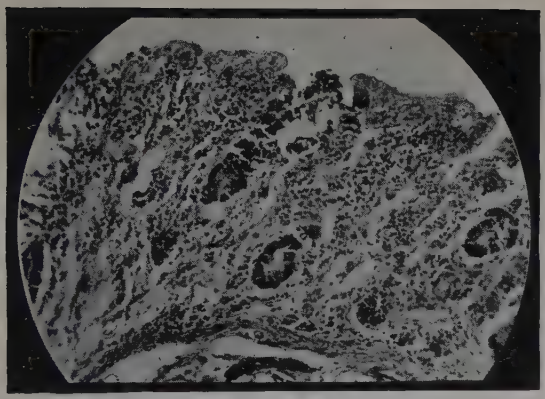

FIG. 13.—Photomicrograph of the Small Intestine in a Case of Chronic Gastroenteritis, showing Cirrhosis of the Mucous Membrane, with Atrophy of the Glands. (× 80.)

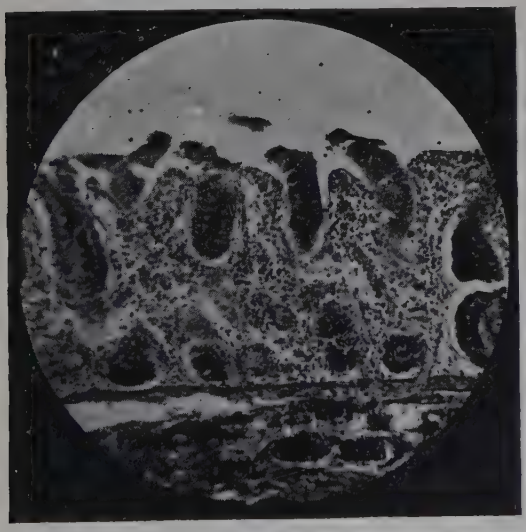

FIG. 14.—Photomicrograph of the Large Intestine in a Case of Chronic Gastroenteritis, showing Partial Destruction of the Glands of the Mucous Membrane. (× 80.)

scending portions of the colon and in the rectum. The superficial epithelium usually persists for a considerable time, and its columnar cells may be recognized, in a degenerated condition, upon the surface of the mucous membrane, when the latter is already in an advanced state of disease. As a rule, the inflammatory process is most pronounced in the centre of the mucous coat of the bowel, so that when fibrous tissue forms the tubular glands appear to be divided through the middle by a fibrous band. The epithelium lining the ducts is partially transformed into cells of the goblet type; while the rest becomes detached and form fatty and granular plugs, which are gradually extruded from the mouths of the glands by the mechanical pressure of the inflammatory exudation (Fig. 12). When the products of inflammation undergo organization, the tubular glands become constricted about their centres and their fundi are converted into flask-shaped retention cysts. In the last stage of the disease the whole of the mucous and submucous coats of the bowel are completely cirrhosed. Occasionally the columnar cells lining an apparently healthy gland are observed to contain a quantity of golden-yellow pigment, as though they were in the act of excreting some product of blood disorganization. In very chronic cases large thin-walled vessels may often be seen coursing through the cirrhotic tissue and forming sinuses of considerable size close to the free surface of the diseased bowel. This remarkable vascularity of the newly formed fibrous tissue is probably the cause of the hæmorrhage which so often occurs during defæcation.

Among the organic changes in other viscera which are apt to be associated with chronic gastroenteritis, disease of the kidney is, perhaps, the most important. In his excellent monograph upon "athrepsia," Parrot describes three morbid conditions of the renal organs which he had encountered in cases of infantile atrophy: fatty degeneration

(steatose), thrombosis of the renal veins, and deposition of urate of sodium in the substance of the organ.

Fatty degeneration of the kidney is of comparatively rare occurrence. When it exists, the organ is slightly increased in size, and presents a pale yellow or mottled appearance, after the capsule has been removed. The cortex is increased in thickness, and at its periphery and near the apex of the pyramids yellow striæ may often be observed. Under the microscope the vessels of the Malpighian bodies are found to be engorged, while the walls of the glomeruli exhibit an excess of nuclei. The first sign of disease consists of an increased opacity of the protoplasm of the columnar epithelium, which gradually resolves itself into a large number of minute granules. These coalesce to form refractile droplets of some size, which stain black with osmic acid, and finally accumulate in such numbers as to block completely the tubules.

Chronic parenchymatous nephritis has been described by certain writers as a frequent complication of chronic catarrh of the gastrointestinal tract in infancy, but in only one of the seventeen cases which I especially examined with reference to this point did the tubules show any signs of inflammation; while Holt only detected renal disease in one case among the series he investigated.

Thrombosis of the renal veins is usually confined to cases of a very chronic and severe type. When it exists, the kidney is found to be enlarged and its capsule tense. Scattered over the surface of the organ are numerous small areas of a purple colour, which upon section are seen to extend some distance into the substance of the viscus. The apices of the pyramids are also deeply congested, and exhibit a blue or black coloration. The medium-sized branches of the renal veins are filled with greyish-white ante-mortem clot, while the larger veins usually contain coagula of recent formation. In rare instances the throm-

bosis may extend as far as the entrance of the renal veins into the inferior vena cava. Capillary hæmorrhages upon the surface or into the tissues of the kidney are often observed, and in a considerable proportion of the cases an apoplectic condition of the adrenals may also be detected (Parrot, Valleix, Mattei).

Uratic concretions in the tubules of the kidney are by no means uncommon. As a rule, they take the form of yellowish-red masses, situated near the apices of the pyramids, which shade off into the substance of the organ in fan-shaped lines of a pale yellow colour. Occasionally the calyces, and even the mucous membrane of the pelvis, are found to be thickly powdered over with amorphous urates.

When examined with the microscope, the straight tubules are seen to be blocked by opaque granular cylinders, which under a high power are found to be composed of a vast number of minute spherical crystals. Considerable discussion has taken place concerning the exact chemical composition of these crystalline deposits, Virchow maintaining that they consist of urate of ammonium, while other authorities (Parrot, West) consider them to be either uric acid or urate of sodium. It is probable that in the majority of cases the sodic salt is the chief constituent of the deposit.

Legendre was the first to show that *fatty degeneration of the liver* is a frequent result of chronic diarrhœa in children. In this condition the organ is seldom notably enlarged, but presents an anæmic appearance, while its tissue is extremely soft and friable. Under the microscope the cells in the outer zone of each lobule are seen to contain a large number of fat globules. Occasionally I have observed the muscle of the *heart* to present similar features, the musculi papillares of the left ventricle being, as a rule, the first portion of the organ to suffer. This fatty degeneration of the heart is possibly the cause of the sudden and fatal syncope which sometimes occurs in cases of chronic gastrointestinal catarrh,

and may also be responsible for the mitral systolic bruit which develops during the later stages of the disease.

In every case where death has occurred from gradual failure of the heart, *congestion* and *œdema* of the *lungs* are found at the necropsy. In most cases catarrh of the bronchial tubes also exists, associated with more or less extensive *lobular collapse*; while in nearly 16 per cent. of my fatal cases death was directly attributable to an attack of *broncho-pneumonia*.

Pulmonary tuberculosis is also frequently encountered at the post-mortem examination, and there can be little doubt that many infants who are supposed to die from simple bronchitis in reality succumb to this disease.

Capillary *hæmorrhages* into the meninges or upon the surface of the *brain* are comparatively common, while in some instances sanguineous effusions of considerable size occur in the region of the medulla or in the substance of the cerebrum. Parrot observed an effusion of blood in the substance of the brain in five out of thirty-four cases of intracranial hæmorrhage.

Thrombosis of the cerebral sinuses is occasionally the immediate cause of death. The anterior longitudinal sinus is the one which is most commonly affected, but sometimes the lateral sinuses or some of the smaller veins situated in the corpus striatum or upon the surface of the brain are affected in a similar manner.

Finally, it may be mentioned that, in a large percentage of the cases of chronic gastroenteritis, the *bronchial* and *mesenteric glands* are found after death to be enlarged and *caseous*, and are not infrequently affected with tubercle.

Symptoms.—The symptoms of chronic gastroenteritis usually commence in an insidious manner, and often develop by almost imperceptible degrees from those which accompany the antecedent condition of dyspepsia. When the disease follows immediately upon an attack of acute catarrh

of the digestive tract, the urgency of the vomiting and diarrhœa gradually abates, but the infant continues to reject its food at intervals, and to void three or four loose motions during the course of each day. These symptoms are accompanied by anæmia, fretfulness, and a steady loss of flesh, and also, as a rule, by an elevation of the temperature at night. Among the 100 cases of the disease to which allusion has been made, nine were stated to have commenced in an acute manner, and it is interesting to observe that in four of these the complaint ensued immediately after an attack of measles. In the remaining ninety-one cases the disease followed chronic indigestion, the transition from one complaint to the other being unattended by any phenomena of sufficient importance to attract the notice of the parents.

Following the teaching of Parrot, it has been the custom to divide the clinical course of the disease into three stages, the first of which is characterized by the prominence of the gastrointestinal symptoms, the second by wasting of the tissues, and the third by certain cerebral phenomena indicative of exhaustion. Although this sequence of events may be observed in many chronic cases, in a very large number the different stages either run concurrently or even appear in reverse order. Thus, cases are frequently met where progressive emaciation and anæmia constitute the primary and most important symptoms of the malady, notwithstanding the fact that both the stomach and intestine are found after death to be in an advanced state of disease. In other cases, again, loss of flesh or cerebral symptoms are present from the commencement and continue throughout the whole course of the complaint. For these reasons I shall merely offer a general description of the disease and its complications, without endeavouring to draw any hard and fast line between its different stages.

Gastric and Intestinal Symptoms.—Symptoms indicative

of inflammation of the stomach or intestine are present in every case at one period or another during the course of the complaint. As a rule, a *loose condition of the bowels* or an abnormal appearance of the stools is the first symptom to attract attention. When the chronic disease follows immediately upon an acute attack, the stools usually number from four to seven a day, and consist of a dirty green or muddy yellow liquid, alternating occasionally with others of a pasty consistence and paler tint; but after a time the motions become quite diffluent and exhale an intolerable stench.

In the more insidious variety, on the other hand, the stools are passed less frequently, and exhibit remarkable variations from time to time. As a rule, they are abnormally copious, and often seem to exceed in volume the total amount of nourishment consumed by the child. At one time they may consist entirely of a pale grey and putty-like material, in which a few lumps or streaks of green are visible; while at another they are composed of a curdy or flaky substance tinged with green and mixed with a small quantity of fluid. At other times, again, the dejecta may closely resemble chopped spinach; or perhaps several ounces of a thin, opaque liquid like gruel may be evacuated from the bowel. In every case the motions possess a most offensive odour, which clings obstinately to the napkins despite repeated washing. With the progress of the disease the stools become diminished in quantity and more fluid in character, and although even at an advanced stage of the complaint they may still present a green and curdy appearance, they more usually consist of a brown and slimy material, containing traces of blood. Occasionally the infant habitually voids a jelly-like substance entirely composed of mucus, or every stool contains a large number of opaque pellets and shreds of the same material.

Hæmorrhage from the bowel is by no means infrequent

in the later stages of the disease, each evacuation being found to contain streaks or clots of bright blood. When the act of defæcation is accompanied by tenesmus, a small quantity of liquid blood is often voided with each motion, but in many of these cases the source of the bleeding is to be found in a prolapse of the mucous membrane of the bowel. As a rule, the frequency of the stools varies inversely with the severity of the vomiting, and when the latter is a prominent symptom of the case, the bowels may be constipated rather than relaxed. Sometimes the diarrhœa presents lienteric features, each meal being immediately followed by the passage of a stool consisting mainly of undigested food. This form of intestinal flux appears to arise from an abnormally irritable state of the bowel, which causes it to be thrown into a violent contraction as soon as food is introduced into the stomach. At the commencement of the disease the motions are invariably acid to litmus-paper, and contain an excess of lactic and other organic acids; but as the complaint progresses the dejecta become less acid, and in advanced cases they may either be neutral or even slightly alkaline in reaction.

Although *vomiting* is commonly supposed to accompany every case of chronic gastritis, it is surprising how few infants with the disease suffer from *continued* emesis. Thus, only 44 per cent. of my cases exhibited this symptom, notwithstanding the fact that a chemical examination of the gastric contents usually indicated the existence of severe anatomical changes in the mucous membrane of the stomach.

In some cases, however, the infant vomits constantly during the whole course of the disease, the milk being rejected in a curdled state almost as soon as it is swallowed. Even in the absence of food the child may be subjected to severe attacks of retching, which have for their object the expulsion from the stomach of small quantities of sticky mucus. When this condition continues unrelieved, the symptoms of

emaciation and exhaustion make rapid progress, and the case often terminates fatally within a few weeks. In other instances vomiting is only of occasional occurrence, unless it be directly provoked by overloading the stomach with food.

All cases are liable to suffer from intercurrent attacks of subacute gastritis, which usually persist for three or four days, and are accompanied by severe vomiting and rapid wasting of the tissues.

Pain in the abdomen is experienced in almost every case at one time or another. It is most common at an early stage, before the diarrhœa has become fully established, and usually subsides to a great extent as soon as the motions assume a liquid character. The symptom is of a colicky nature, and arises from the presence of irritant materials or gas within the inflamed bowel. In cases of lienteric diarrhœa sudden and severe griping in the umbilical or hypogastric region precedes, and perhaps accompanies, each action of the bowels. The infant expresses its sense of abdominal discomfort by constant contraction of the muscles of the forehead and face, spasmodic flexion of the legs and thighs, and by frequent twistings and writhings of the body. In long-standing and neglected cases the flexor muscles of the lower limbs become permanently contracted, so that it is impossible to straighten the legs without the use of an anæsthetic.

General Symptoms.—After the lapse of a period of time, which varies with the severity of the digestive disorder, the child commences to *lose flesh*. At first it may merely be that the body-weight fails to exhibit its usual weekly increase. It soon becomes apparent, however, that an actual decline in weight is taking place, owing to wasting of the soft tissues. Loss of elasticity of the skin covering the deltoids, glutei, and adductor muscles of the thighs is one of the earliest and most conspicuous signs of failure of nutri-

tion, the superficial tissues becoming flabby and capable of being pinched up between the fingers into loose folds. The subsequent absorption of subcutaneous fat causes a peculiar wrinkling of the epidermis, so that after a short time it hangs loosely about the arms and thighs, and becomes arranged in a series of fine plaits along the inner margins of the buttocks.

Loss of flesh from the face tends to accentuate the lines which normally exist round the eyes and mouth, while the deep furrows produced by the incessant whining and crying of the infant give rise to that peculiar pinched, aged, and woebegone expression which is so characteristic of the disease. Next in order of frequency, the skin covering the abdomen and scapulæ exhibits the same flabby and wrinkled appearance; indeed, so loose do the integuments become in these regions, that it often appears possible to grasp a handful of tissue and to suspend the wasted infant, like a rabbit, by the skin of its back. Among the voluntary muscles, the adductors and extensors of the thighs, the gastrocnemei, deltoids, and scaleni are the first to show signs of atrophy, and after a time present the appearance of thin cords when put upon the stretch. Finally, every muscle in the body, both voluntary and involuntary, participates in the general wasting, so that the long bones become denuded of flesh and look like sticks covered with loose folds of skin. The bones themselves cease to increase in size at an early period of the complaint, and as soon as the soft tissues commence to waste, their compact tissue is gradually absorbed, and they consequently become fragile and prone to fracture. The bones of the head also suffer in a similar manner, more especially the upper and lower maxillæ, and this, combined with the wasting of the cheeks, makes the cranium appear of undue size when compared with the face. In those cases, however, where vomiting and diarrhœa are very severe, the rapid loss of fluid from the body causes the anterior

fontanelle to recede, and the bones of the vertex to overlap along their sutures, so that the whole head appears to diminish in size. Contrary to what is often observed during convalescence from other disorders of early life, children who recover from chronic gastrointestinal catarrh usually remain stunted in stature for a considerable time, and, though strong and muscular, may continue unusually short, and often backward in mental development, for many years after the cure of the digestive disease. The actual loss of weight which occurs week by week varies according to the age of the child and the severity of the complaint. Thus, in rapid and severe cases, as much as 10 to 16 ozs. may be lost in a single week; but in the more usual and insidious form of the complaint the average does not exceed 3 to 7 ozs. in the same period of time. As emaciation proceeds, the child begins to lose colour, and eventually becomes the subject of severe anæmia. In some cases the skin assumes a grey or clay-coloured tinge, while in others the face and hands acquire a faint yellow or bilious colour; but in all severe cases the anæmia eventually becomes extremely pronounced and progressive in character. The importance of this symptom will be further discussed when the subject of prognosis is considered.

The secretory functions of the *skin* become impaired at an early stage of the complaint, and the surface of the body appears dry and harsh to the touch. Cutaneous eruptions are common at all periods of the disease, and strophulus existed in 28 per cent. of the cases which came under my observation. As a rule, the eruption principally affects the skin of the abdomen and face, but in severe cases the whole surface of the body may be closely studded with papules. In some cases the rash only makes its appearance in the evening after the body has been washed, and is then attended with such intense irritation that the child is prevented from sleeping during the early part of the night. Eruptions

of an eczematous nature are extremely common in advanced or neglected cases, and existed in 38 per cent. of my cases. As a rule, the scalp and posterior portions of the pinnæ are the parts most frequently attacked, but in severe instances the folds of the groins and axillæ, as well as the face, neck, buttocks, and thighs, may be affected in a similar manner. In very chronic cases, small boils, or subcutaneous abscesses containing curdy pus, are apt to make their appearance upon the buttocks and backs of the thighs, and give rise to unhealthy-looking ulcers, which penetrate some distance into the subjacent tissues. The constant contact of the acid dejecta with the skin over the gluteal region causes it to become reddened and excoriated; while not infrequently superficial ulcerations occur round the anus and in its neighbourhood. In rare instances sloughing of the prepuce and scrotum or gangrene of the vulva is observed. At a late stage of the complaint the hands and feet often become puffy and œdematous, and even the skin of the legs and thighs may exhibit some degree of pitting upon pressure. This condition is usually ascribed to disease of the kidney, but in most cases it is due to a gradual failure of the circulation.

Chronic gastroenteritis is usually accompanied by a remittent form of *pyrexia*, the internal temperature of the body rising to about 100 or 101° F. at night, and falling to 98 or 99° F. in the morning. In some cases short spells of fever alternate every few days with apyrexial periods, and in such it is not unusual to find after death that miliary tuberculosis has complicated the original complaint. Continuous fever, exceeding 102° F., usually indicates either a subacute attack of intestinal catarrh or some pulmonary or other serious complication. With the approach of death, the temperature of the body often rises rapidly and may attain 106° F. either at or soon after the fatal event. At the commencement of the disease the *appetite* is well

maintained, and the child often exhibits an insatiable desire for food; but as soon as the complaint has reached the chronic stage the appetite invariably declines, so that at the last it is almost impossible to persuade it to swallow more than an occasional mouthful of nourishment.

Thirst is always present, more especially in those cases where diarrhœa or vomiting constitutes the principal symptom of the complaint. At first the *tongue* is somewhat redder than normal, and the dorsum presents a thick coating of greyish-brown fur; but after a time the organ tends to become pale and flabby, and is either quite clean or merely covered with a thin white fur. In the final stages of the complaint the mucous membrane of the tongue, as well as that of the buccal cavity and fauces, becomes the seat of parasitic inflammation, and small ulcerations make their appearance along the sides of the tongue and at the angles of the mouth. These morbid conditions of the mouth are of considerable importance, since they not only tend to destroy the appetite, but cause so much pain during the act of sucking or swallowing that the infant refuses its food, and in consequence suffers from rapid emaciation.

The *urine* is always diminished in quantity, and when the diarrhœa is profuse only a few drachms may be passed in the course of the twenty-four hours. The fluid is usually turbid when freshly voided, and presents a copious sediment of uric acid and amorphous urates after standing for a short time. Micturition is sometimes accompanied by severe pain in the perinæum or glans, and in such cases it is not unusual to find crusts of crystalline material adherent to the orifice of the urethra or embedded under the prepuce. The total acidity of the urine tends to diminish during the course of the disease, but the daily quantity of urea eliminated usually exceeds the normal until the body has undergone a considerable degree of emaciation. Many writers state that the disease is frequently associated with

albuminuria and glycosuria. In order to test the accuracy of this statement, I had the urine drawn off in a large number of cases and carefully tested for these abnormal ingredients. In all, only 6 per cent. of the cases exhibited a trace of albumin, while sugar was never detected. These facts, taken in conjunction with the rarity with which parenchymatous nephritis is encountered after death, appear to indicate that renal inflammation is by no means so common a complication of chronic gastroenteritis as is commonly believed.

The sediment of the urine usually consists of crystals of uric acid, mixed with a variable quantity of amorphous urates of sodium and potassium, but occasionally hedgehog crystals of ammonium urate or spherical masses of the sodium salt can also be detected. Epithelial casts are rarely encountered, but hyaline cylinders, either simple or filled with uratic salts, are by no means infrequent. Fatty casts I have never observed.

It is usually a matter of some difficulty to count the pulse and to estimate its volume in young infants affected with inflammation of the digestive tract, while the heart-sounds are frequently obscured by rhonchi or by an abnormally harsh vesicular murmur. As a rule, in the early stages of the disease, the *pulse* varies between 90 and 110 per minute according to the temperature of the body and the degree of exhaustion; but as the complaint progresses the radial pulse becomes more and more feeble, and at the same time increases in frequency. It is a curious fact, however, that with the approach of death the action of the heart becomes slow, and often intermittent, so that perhaps not more than sixty beats can be counted per minute when the organ is auscultated. The respiratory movements are increased in frequency during the early stages of the disease, even in the absence of any pulmonary complication; but as soon as the symptoms of exhaustion become pronounced,

the breathing is usually slow and laboured, and may finally present the characters of the Cheyne-Stokes respiration.

The exhaustion of the *nervous system* which results from non-assimilation of the food and the loss of fluid from the bowel, makes itself apparent in a profound alteration in the general appearance and behaviour of the child. The incessant screaming and whining which characterize the initial stage of the complaint become replaced by apathy and depression, so that the child lies in its cot in a semi-somnolent state, and merely expresses its sense of discomfort by momentary contortions of the face or by an occasional moan. In this condition it may remain for many days, or even weeks, capable of swallowing food placed in its mouth, but otherwise exhibiting but few signs of life. Gradually the face becomes more and more pinched, the extremities cold and livid, the pupils dilated and sluggish in reaction, and finally death is ushered in so quietly that it is almost impossible to discern the moment when the spark of life is actually extinguished. In a large number of cases, however, the infant suffers either from local or general convulsions during the last stages of the disease, which are characterized by sudden rotation of the eyeballs, dilatation of the pupils, and tonic or clonic spasms of the muscles of the extremities. Sometimes these seizures are repeated at short intervals, the child remaining unconscious between the attacks, and finally succumbing to respiratory failure. In other instances the fits only occur once or twice, and apparently exert no deleterious influence upon the course of the disease.

Occasionally retraction of the head with strabismus appears to denote the presence of meningitis, but in such cases signs of inflammation in the brain can seldom be discovered after death.

Complications and Sequelæ.—Among the numerous complications that are apt to occur during the course of chronic

gastroenteritis those which affect the pulmonary organs are the most frequent and important. *Catarrh of the pharynx* is extremely common in cases where vomiting accompanies the gastric disorder, and not infrequently spreads to the mucous membrane of the larynx and trachea, and gives rise to the short, dry cough and hoarse cry so frequently observed. In more than one-half of the entire number of my cases, examination of the chest revealed the signs of *bronchitis*, which in 29 per cent. was of sufficient severity to demand special treatment. *Broncho-pneumonia* existed in 13 per cent. of the cases, and affected one lung (usually the left) in 8 per cent. and both lungs in 5 per cent. In every instance where death ensued from gradual asthenia, the lungs showed signs of *hypostatic congestion* during the last few days of life, and in 3 per cent. a moderate *effusion* into the right pleural cavity was recorded. Acute pleurisy, on the other hand, was never observed, except in association with pneumonia. In two cases, where the patients succumbed rapidly with symptoms of cardiac failure associated with a high temperature, *purulent pericarditis* was found at the necropsy to have been the immediate cause of death; but in neither instance was a friction sound detected during life.

The subjects of chronic gastrointestinal catarrh are extremely susceptible to intercurrent attacks of *acute* or *subacute inflammation* of the *digestive tract*. This complication sometimes ensues as a result of some change of diet; but during the summer months a large number of chronic cases are always attacked by the epidemic variety of intestinal catarrh. The occasional occurrence of *parenchymatous nephritis* has already been noticed; but in my own practice I have only seen one case where œdema of the face and legs was associated with the presence of albumin and casts in the urine, and in this instance the infant eventually recovered. Other writers, however, have described a series

of symptoms which attend the renal complication, among the most prominent of which are loss of elasticity of the skin over the abdomen, œdema of the extremities, vomiting, restlessness, and convulsions, accompanied by scanty and albuminous urine containing hyaline and epithelial casts.

Of the cerebral complications of the disease, *thrombosis of the venous sinuses* and *apoplexy* are the most important. Of the former I have only observed one case, although it is possible that many others may have escaped my notice or occurred after the patient's last visit to the hospital.

The profound malnutrition which accompanies chronic inflammation of the alimentary canal renders the subjects of the complaint unduly susceptible to the invasion of various *infectious diseases*, such as measles, scarlatina, and pertussis; while in hospital practice, at any rate, acute *miliary tuberculosis* is responsible for a considerable proportion of the deaths. Even when a child recovers from the immediate effects of the disease it is very apt to suffer from *rickets* during the period of convalescence. Thus, no fewer than 27 per cent. of my cases which eventually recovered presented more or less pronounced signs of rickets before their final discharge from hospital.

Chronic purulent discharges from the nose, ears, or vagina are not infrequently encountered, and the enlarged glands which make their appearance in the neck or groin occasionally prove the starting-point of tuberculous adenitis.

There is, however, one result of chronic enteritis in infancy to which I would draw special attention, both on account of its practical importance and also because it appears hitherto to have escaped attention. It is a well-known fact that infants who recover from chronic inflammation of their digestive organs usually do so in a slow and unsatisfactory manner, and not only continue very susceptible to attacks of gastric catarrh from exposure to cold or some slight indiscretion in diet, but may remain for

many years stunted in stature and deficient in strength and energy. But it is not so generally understood that the gastric disease contracted, and apparently cured, in infancy, is capable of exerting a deleterious influence upon the functions of digestion in adult life. Some years ago, when engaged upon a microscopical examination of the stomach in persons dying of different complaints I frequently observed small patches of cirrhotic tissue in the mucous membrane near the lesser curvature. These signs of disease were obviously of old standing, and seldom appealed to the naked eye by indications more obvious than a slight pitting or puckering of surface. The subject became endowed with renewed interest when I afterwards had an opportunity of examining the digestive organs of children who had suffered during infancy from severe catarrh of the alimentary tract, and in whose stomachs well-marked patches of cirrhosis could be detected with the microscope. In these cases also the signs of disease were found chiefly, though not exclusively, near the lesser curvature of the organ. That this particular region of the stomach should so often present the relics of former mischief is hardly a matter for wonder when it is remembered that the increase in the size of the organ which occurs after the second year of life mainly involves the cardiac and middle thirds of the viscus, and that consequently any permanent damage done to the mucous membrane in early infancy would always be most conspicuous in the least altered portion of the organ.

There is a distinct clinical variety of gastric myasthenia which develops about the time that the growth of the body is completed, and proves most intractable to treatment. The fact that this complaint finds its chief victims among those who exhibit a sudden and remarkable rapidity of growth at a somewhat advanced age has led to the disorder being regarded as a result of " outgrowing of strength." Apart, however, from the important distinctions which

exist between the complaint in question and that which might reasonably be placed in this popular category, it is an interesting fact that in many of these cases evidence of the most convincing nature can be obtained of a prolonged attack of gastric or intestinal inflammation during the period of infancy. Thus, in several cases which have come under my immediate notice, the life-history of the patient, as obtained from the mother, was of the following kind: As an infant, the patient had seemed quite healthy until owing to a sudden failure of the maternal milk or from some other cause which prevented suckling, recourse was had to artificial methods of feeding. As the result of this the child immediately became ill, lost flesh, and suffered from sickness and diarrhœa, and, in spite of repeated changes in the diet, became so weak and emaciated that the parents nearly abandoned hope of its recovery. Under medical care, however, it eventually improved, but remained for many years unduly small for its age, and suffered from obstinate constipation or from recurrent and severe "bilious attacks." After the age of fifteen the growth of the body became extremely rapid, and as soon as it was completed, symptoms of weak digestion, accompanied by atony of the colon, made their appearance, and had persisted ever since. Cases of this nature constitute a distinct class of habitual dyspeptics, and are encountered in every variety of medical practice. Unless carried off by some intercurrent disease like pneumonia or tuberculosis, the victims of this disorder remain for the greater period of their lives thin and anæmic, and not infrequently suffer from melancholia or hypochondriasis. The chain of evidence which connects cases of this kind with antecedent disease of the mucous membrane of the stomach and intestine is at present incomplete, inasmuch as it has hitherto been impossible to submit their stomachs to a microscopical examination; but there can be little doubt that chronic gastroenteritis

in infancy can leave its mark upon the digestive organs for many years and exert an important and deleterious influence upon the functions of the stomach and intestine in later life.

Physical Examination.—As long as the inflammation persists in a subacute form, the abdomen is found to be somewhat retracted, the superficial muscles rigid, while pressure with the hand gives rise to pain. In the chronic condition, on the other hand, the abdominal walls are usually flaccid, and the gaseous distention of the stomach and bowels which commonly accompanies the disease may cause a perceptible separation of the recti muscles.

By careful examination, the existence of dilatation of the stomach can always be determined, and in many instances the lower border of the organ is found to extend below the level of the umbilicus. When a soft tube is passed into the stomach and air pumped in by means of a hand-bellows, the viscus may be ballooned with the greatest ease, a fact which forcibly demonstrates the presence of myasthenia.

In those cases where the disease is not attended by vomiting and where stagnation of the gastric contents habitually occurs, the characteristic splash can always be obtained by appropriate manipulation. Occasionally the lower edge of the liver projects below the costal margin, while the left lobe of the organ is detected in the left hypochondrium in close proximity to the spleen. When tenesmus, arising from follicular ulceration of the large intestine, is a prominent symptom of the case, the introduction of the finger into the rectum gives rise to pain, and often causes a reflex spasm of the anal muscles.

Chemistry of Digestion.—The morbid processes which occur in the mucous membrane of the stomach during the course of the disease give rise to important changes in the chemical composition of the gastric juice. In appearance, the contents of the organ vary considerably, but as a rule they are extremely viscid, owing to an excess of mucus.

For this reason filtration is a matter of much difficulty, and it is often necessary to manipulate the material in its crude state. Its reaction to litmus-paper is usually acid, but in advanced cases of the disease the contents of the stomach may be neutral. In a certain number of cases (nine) I have been enabled to contrast the results of a chemical examination of the contents of the stomach made during life with the microscopic appearances presented by the organ after death, and these, when taken in conjunction with numerous other observations conducted at different periods of the complaint, permit of several general conclusions being arrived at.

In the *first stage* of the disease, the contents of the stomach, when extracted one and a half hours after the test-meal, exhibit a large amount of mucus and much undigested curd. Leo states that the total acidity in these cases is often higher than normal, owing to the presence of organic acids produced by fermentation; but I have never found it to exceed 0·135 per cent. HCl, while not infrequently it did not amount to more than 0·08 per cent. HCl.

One of the most important features is the invariable absence of free hydrochloric acid and the marked diminution in the quantity of the mineral acid combined with the proteid elements of the food. These facts are in strict accordance with our knowledge of the changes which occur in the gastric secretion from inflammation of the stomach in adult life. Lactic acid, as evidenced by a positive reaction with Ueffelmann's solution, is present in every case, and traces of butyric acid may frequently be detected. Under the microscope, pieces of curd, fat globules, epithelial cells, and numerous bacteria are observed.

In the *second stage* of the disease, where the gastric glands are beginning to suffer compression by the newly formed fibrous tissue, the contents of the stomach still contain an excess of mucus, and often possess a pungent smell from the

presence of butyric acid. Free hydrochloric acid is invariably absent, and the combined acid is much diminished, although, owing to the presence of secondary acids, the total acidity may exceed 40.

In the *third* and *atrophic stage* of the complaint, the secretion of mucus usually fails, and the residue of a test-meal, even after a lengthy residence in the stomach, may possess hardly any appreciable degree of acidity. Pepsin may also be absent from the mixture, although both it and the rennet ferment can still be extracted from the mucous membrane by the introduction of dilute hydrochloric acid into the stomach.

The comparative slowness with which the stomach disposes of the food it receives affords important corroborative evidence of the enfeebled state of its muscular walls. Thus, in eight cases in which the symptoms of the complaint were supposed to have existed from two to four weeks, the organ was found to contain curdled milk from two and a half to two and three-quarter hours after the administration of 2 ozs. of milk and water. In twenty-three instances, where the disease had existed from six to twelve weeks, the stomach was seldom found to be empty until after the lapse of three hours and a quarter; while in nine cases which exhibited a duration of more than three months, the organ often contained an appreciable amount of milk five hours after the meal.

Examination of the Blood.—It appears to be an established fact that at birth the blood is exceptionally rich both in corpuscles and colouring material. The exact number of the red corpuscles, as estimated by different observers, varies between 5,360,000 (Hayem) and 6,700,000 (Otto, Gundobin) per cubic millimetre, while about 12,000 to 15,000 white corpuscles are to be found in the same volume of blood. During the first few hours of life a slight increase in the number of corpuscles can usually be observed, but

after the lapse of a day or two a steady decline sets in until the corpuscular richness approximates closely to that which obtains in adult life. The blood of a new-born infant is also peculiarly rich in hæmoglobin, but this likewise diminishes in quantity after the first week.

Quantitative estimation of the blood in infancy is beset by considerable difficulties, and the conclusions arrived at are often delusive, owing to the influence exerted upon the constituents of the blood by the state of the general health. Thus, it is found that a rise in the body temperature causes a rapid diminution in the number of the red corpuscles ; while an attack of diarrhœa, probably by concentrating the fluid in the circulation, is accompanied by an apparent increase in the percentage of corpuscles and hæmoglobin.

In thirty-one cases of chronic gastroenteritis, regular estimations of the blood were made by means of the hæmacytometer and hæmoglobinometer of Gowers. The results of these investigations appear to show that at the commencement of the complaint a marked decrease in the percentage quantity of hæmoglobin may usually be observed. Thus, in fourteen cases where the symptoms of the complaint were stated to have lasted less than three weeks, the colouring material varied between 65 per cent. and 78 per cent., while the corpuscular richness varied between 80 per cent. and 90 per cent. In every case the objective signs of anæmia were visible in the lips, conjunctivæ, and skin. In one case of chronic marasmus, where microscopical examination eventually proved that the stomach and intestines were in a condition of moderate cirrhosis (Fig. 11), an examination of the blood made upon the day previous to death showed red corpuscles, 78 per cent. ; hæmoglobin, 66 per cent. In the last stage of the complaint, where the stomach is dilated and the secretion of gastric juice reduced to a minimum, a steady diminution occurs both in the number of corpuscles and in the amount of hæmoglobin, so that in very chronic

cases it is not unusual to find that the percentage of the former is less than 50, and of the latter less than 36. In such cases the anæmia is very conspicuous, and in many instances the loss of colour is so profound as to simulate the pernicious form of the disease in adult life. It is, therefore, not unreasonable to infer that the gradual destruction of the digestive and absorptive powers of the alimentary tract is an important factor in the causation of the severe anæmia.

Progress and Termination.—The course pursued by the disease varies considerably in different cases. In out-patient practice it is usually observed that, when the complaint has once attained a certain degree of chronicity, it continues to make steady progress toward a fatal issue, owing to the adverse hygienic surroundings of the children of the poor and the impossibility of providing the patients with those special forms of nourishment that are indispensable for the maintenance of health. When it is also remembered that in such cases medical advice is seldom sought until the disease has existed for many weeks, it is hardly surprising that chronic inflammation of the digestive tract in infancy is attended by such a high mortality.

In the subacute form of the disease, where vomiting and diarrhœa are severe, death often occurs from asthenia or some intercurrent complaint between the fourth and the seventh weeks or even earlier. But in the more chronic variety, where progressive emaciation and anæmia are the chief objective phenomena, the infant may linger for many months, and eventually succumb either to gradual exhaustion or to one of the numerous complications of the disease. Among the 100 cases which were selected for special examination, no fewer than thirty-three died during their treatment at the hospital. Even this high percentage probably underrates the actual mortality, since it was impossible to follow the ultimate progress of many of the remaining cases ;

and I have a strong impression that if the truth could be ascertained, the death-rate from the primary disease or its sequelæ would be nearer 50 than 30 per cent.

Among the thirty-three cases which were known to have ended fatally, nine, or 27·2 per cent., died from asthenia, syncope, convulsions, or from some other cause directly connected with the primary complaint. In six cases (18·1 per cent.) death resulted from an attack of acute intestinal catarrh; in five instances (15 per cent.) bronchopneumonia was responsible for the fatal issue; while in the remaining thirteen (39·7 per cent.) the infant contracted some infectious disorder, such as pertussis, measles, or scarlatina, which rapidly brought life to an end.

With regard to the actual duration of the disease in the fatal cases, statistics have only a limited value, owing to the habitual inaccuracy which characterizes all the statements made by hospital patients concerning the ailments of themselves and their children. As far as could be ascertained, however, in 61 per cent. of the cases the disease had lasted from one to two months; in 27 per cent., from two to four months; in 9 per cent. from four to six months; and in 3 per cent. for more than six months.

Prognosis.—In the early stages of the complaint, before the mucous membrane of the alimentary canal has suffered permanent injury, a cure can usually be effected by the strict observance of those elementary principles which should regulate the diet and hygiene of infancy. When, however, the stomach and intestines have become the seat of extensive cirrhosis, both digestion and absorption are dangerously impaired, and death will assuredly result, either from general malnutrition or from an attack of some intercurrent disease. The main point to determine, therefore, is whether the inflammatory mischief has produced irreparable damage to the digestive organs or not. Personally, I am in the habit of dividing cases of chronic gastroenteritis

into three classes, according to the length of time the disease has lasted, the severity of the general symptoms, and the functional state of the stomach as determined by physical and chemical examination.

The *first* class includes all cases in which the complaint has commenced in an *insidious* manner, and has not lasted for more than two or three weeks. In such the main symptoms consist of a gradual loss of flesh, abdominal pain, flatulence, and failure of appetite. Vomiting only occurs at intervals or after a particularly copious meal, while the stools present a pasty appearance, alternating occasionally with others of a more liquid character. Bronchial catarrh, if it exists at all, only affects the larger tubes, and the blood contains more than 80 per cent. of red corpuscles and 75 per cent. of hæmoglobin. Examination of the stomach after a test-meal shows that its motor activity is so far preserved that the organ is empty within two and a half hours; while the curdled milk which can be withdrawn at the end of an hour and a half presents signs of partial digestion. Although free hydrochloric acid is absent, the contents of the organ are very acid, and on examination it can be shown that the combined acid in the mixture is not appreciably diminished.

Cases which present these general features are extremely common and constitute the bulk of those where progressive loss of flesh is the chief symptom of the disease. The prognosis is good, since the infant, if provided with diluted and sterilized cow's milk and cream, commences to improve at once and eventually makes a perfect recovery.

In the *second* class, the disease has existed for many weeks, and has given rise to organic changes in the digestive canal. Vomiting is often observed and the motions are frequent, watery, and extremely offensive. Anæmia is present to a marked degree, and examination of the blood shows that its corpuscular richness is less than 80 per cent., while

the percentage of hæmoglobin varies between 50 and 70. The stomach is invariably dilated, and contains food three hours or more after the administration of a test-meal. The gastric contents exhibit an excess of mucus which hinders filtration; free hydrochloric acid is absent, and the quantity of the combined acid is much diminished. The peptic and rennet ferments are still present, but the mixture after acidification digests slowly and imperfectly. Bronchitis is usually present, and not infrequently the mouth is affected with parasitic stomatitis, while the anus and thighs are excoriated by the alvine discharges. The body of the child is much emaciated, and the temperature elevated a degree or two each evening.

In these cases the prognosis, both immediate and remote, must be extremely guarded, for, in addition to the danger arising from the original disease, death is prone to occur at any time from pulmonary or other complications. When recovery sets in, the first sign of good omen is usually a cessation of the peevish crying and a greater degree of restfulness at night. This is followed by increased appetite, diminished thirst, and subsidence of the fever. The body also ceases to lose weight, although several weeks may elapse before the child can positively be said to be gaining weight. When this does take place, the face and neck are usually the first to exhibit an increase in the amount of subcutaneous fat. A rapid increase in the percentage of hæmoglobin occasionally precedes all other signs of returning health, while a marked improvement in the motor and secretory functions of the stomach may be regarded as certain evidence of ultimate recovery.

In the *third* class must be included those numerous cases where the protracted nature of the complaint has reduced the infant to a state of extreme emaciation and anæmia. Although the appetite may be ravenous, and the symptoms of disordered digestion but little apparent, the child con-

tinues to go from bad to worse, despite every care. Examination of the stomach shows it to be considerably dilated and in the habit of retaining food for several hours; while its contents, when extracted an hour and a half after a test-meal, contain hardly any mucus and are almost devoid of hydrochloric acid and pepsin. In very chronic cases, even the secretion of rennet is suppressed. The skin and conjunctivæ appear bloodless, and if any blood can be extracted by pricking the finger, it presents a pale pink and watery appearance, and is found to contain less than 50 per cent. of corpuscles and hæmoglobin.

In such cases the prognosis is hopeless, for the atrophic condition of the mucous membrane of the alimentary tract precludes any possibility of the digestive organs regaining that degree of functional activity which is necessary for the preservation of life.

Diagnosis.—The diagnosis of chronic gastroenteritis seldom presents any material difficulty. It is true that loss of flesh and anæmia may accompany such diseases as congenital syphilis, rickets, and tuberculosis, but in these cases some other symptoms of the complaint are invariably present and aid in its detection. Thus in congenital syphilis, there is usually a history of snuffles, the nose is flattened, and scabs or sores may be observed about the nostrils or angles of the mouth. The skin of the body is dry and wrinkled and often covered with a coppery eruption. Mucous tubercles may sometimes be detected in the mouth or round the anus, while the buttocks, hands, and feet may present the red and polished appearance so characteristic of the disease. In the inflammatory disease, on the other hand, the skin has an earthy tint, and if any eruption is present, it is of a strophulous and not of a specific nature. The excoriated condition of the skin around the anus is also quite different from the appearance presented by the parts in cases of syphilis.

In acute general tuberculosis, the most noticeable symptoms arise from the implication of the pulmonary organs. The child coughs incessantly, and examination of the chest reveals either generalized bronchitis or patchy consolidation. The fever which accompanies the disease is of a remittent character, and much more severe than in cases of catarrh of the alimentary tract. The bowels are more often confined than loose in their action, and copious perspirations occur at night-time. As the disease progresses the legs and ankles become œdematous, and in many cases the meninges or peritoneum are invaded by tubercle.

When the wasting of the body arises from rickets, the changes in the bones of the skull and extremities, delayed dentition, the tumid belly, and other signs of the disease are a sufficient guide to the nature of the complaint.

Treatment.—*General.*—Whenever the gastric or intestinal symptoms are severe, the child should be confined to its cot, and the air of the bedroom maintained at a temperature of about 65° F. In less urgent cases, the infant may be wheeled out into the fresh air once or twice a day, if the weather permits. A warm bath may be given night and morning, care being taken to avoid any exposure to cold. In every case the child should be warmly but not too heavily clad, and it is wise to keep a flannel bandage or some carded wool covered with flannelette constantly applied round the abdomen.

If the nates show any signs of redness or excoriation, they should be carefully cleansed once or twice a day with thick oatmeal and water, and afterward dusted over with a powder composed of equal parts of oxide of zinc and starch, or, if necessary, dressed with zinc or boracic ointment. The napkins must be changed at regular intervals, and, along with any other soiled linen, should be thoroughly disinfected before being washed. If phimosis is present, an attempt must be made to dilate the orifice of the prepuce

in order to promote the complete and regular evacuation of the contents of the bladder. Symptoms of collapse require to be combated by the application of warmth to the extremities, and by the administration of suitable stimulants; while thrush and the various other complications of the disease must be treated in the usual manner. As soon as convalescence is well advanced, much good will usually accrue from a few weeks' residence in the country or by the seaside.

When the stomach is much dilated and its contents exhibit an excess of mucus, it is wise to cleanse the organ before active treatment is commenced. For this purpose a soft catheter of moderate diameter should be employed, and warm water introduced into it through a glass funnel under atmospheric pressure. Occasionally, however, some difficulty is experienced in the evacuation of the contents of the stomach by the simple process of siphonage, and it is necessary to replace the funnel by a glass syringe, and to empty the organ by means of suction. For the purposes of lavage, pure water at the temperature of the body is to be preferred to anything else, the fluid being introduced slowly and in quantities not exceeding 2 ozs. at a time. The addition of a few grains of bicarbonate of sodium to each douche is of value in those cases where the vomit contains an excess of tenacious mucus. Personally, I am opposed to the use of such antiseptics as resorcine, boracic acid, and naphthalin for the purposes of lavage, since absorption readily takes place from the stomach, and serious symptoms have been known to follow the use of even the least poisonous of these remedies. In the severe and obstinate forms of the disease it is necessary to cleanse the organ every morning, but after a few days three times a week is usually sufficient.

The soft tube and funnel are also of considerable use in the performance of forcible feeding (gavage). It is well

known that many infants who reject everything they swallow will retain in their stomachs any food which has been forcibly injected into the organ. This fact is made use of in cases where persistent vomiting precludes the administration of nutriment by the mouth; and it is often found that after forcible feeding has been employed for a short time, the tendency to emesis disappears. This method is also of value in the later stages of the complaint, when an absence of appetite prevents the child from taking sufficient nourishment.

Diet.—Since the majority of cases of chronic gastroenteritis arise from improper feeding, the selection of a suitable dietary is a matter of the greatest moment. In breast-fed children the state of the mother's health must be made the subject of careful examination and her milk submitted to analysis. Should she be found to be suffering from some grave constitutional or organic disease or if the infant exhibits a marked distaste for the breast and suffers from sickness or purging after each meal, it is advisable to prohibit nursing and to procure a wet-nurse instead. If, however, the child takes the breast with avidity, but appears dissatisfied at the end of the meal, it is probable that the symptoms of inanition result from the innutritious quality of the mammary secretion. In these cases the breast must be supplemented by humanized milk or some other modification of cow's milk.

In the case of hand-fed children, all varieties of milk and farinaceous foods must be suspended until the alimentary canal has been cleansed from the masses of curd and fermenting material with which it has been overburdened. The subsequent choice of a dietary must depend upon the severity of the digestive disease. When vomiting or diarrhœa constitutes the prominent features of the case, fresh milk almost invariably disagrees, owing to its tendency to undergo fermentation in the inflamed stomach. It is

necessary, therefore, to maintain the strength of the infant by the judicious employment of albumin-water or the various animal broths. Veal, mutton, or chicken broth may be given every hour in doses of a tablespoonful or more; or raw meat juice, Valentine's meat juice, oxo, or bovril. After the lapse of twenty-four hours, whey may be tried, and if this agrees, a little cream may be added to it. Should the irritability of the stomach continue, a few drops of brandy or champagne or white wine whey may be given with each meal. As the child continues to improve, the diet may further be strengthened by the addition of Mellin's food or that of Savory & Moore or Allen & Hanbury, bread jelly, cream mixture, or even the yolk of an egg beaten up with barley-water and brandy.

As soon as the gastric and intestinal symptoms have to a great extent subsided, a cautious trial may be made with milk. In severe cases this should always be peptonized at first and given in the proportion of one part to three or four of barley-water. In ordinary cases peptonization is not necessary, and sterilized milk suitably diluted with barley- or albumin-water may be employed instead. Should the diarrhœa remain in abeyance and the stools fail to exhibit an excess of undigested curd, the proportion of milk may cautiously be increased until the child can take equal parts of milk and barley-water without discomfort. In rare instances the unsweetened form of condensed milk or Horlick's malted milk is found to agree when every other form produces sickness or diarrhœa; but the former should not be given in a proportion greater than one teaspoonful to eight ounces of water until its effects have carefully been tested.

After the age of six months it is advisable to add a certain quantity of farinaceous material to the dietary. For this purpose malted foods are particularly valuable and a teaspoonful of Mellin's food or other varieties may be mixed

with the milk or broth. At a later period a little wholemeal flour, oatmeal, arrowroot, or the Revalenta Arabica prepared with powdered malt may be used. Sanatogen is sometimes useful.

In every case the food must be given at regular intervals, and the utmost care taken to ensure the cleanliness of the various cooking utensils employed in its preparation. Under ordinary conditions, it may be warmed to the temperature of the body previous to its administration, but when diarrhœa is severe it should be artificially cooled by means of ice, so as to avoid exciting the peristaltic movements of the intestine. In the chronic forms of the disease, especially when the children have been nourished entirely upon preserved milk and farinaceous foods, it is by no means uncommon to observe a tendency to swelling and ulceration of the gums. This condition is always accompanied by severe anæmia, and seems to be of scorbutic origin. In such cases the administration of a small quantity of orange- or lemon-juice every day is followed by a rapid improvement both in the general health and also in the state of the digestive organs. After the age of twelve months a little fresh vegetable should be included in the dietary, well-boiled onion, celery, asparagus, potato, or vegetable marrow being the most suitable. Henoch speaks of the value of a compote made from dried whortleberries in cases of obstinate diarrhœa; while in certain country districts acorn-tea is extensively used for a similar purpose.

But, despite every effort, there will always be found a certain number of cases which are unable to take liquid nourishment without suffering from diarrhœa. In such the use of the raw meat pulp is often attended by very satisfactory results. The pulp must be prepared in a careful manner and given at first in teaspoonful doses at intervals of two or three hours. As a rule, children soon acquire a liking for the raw meat, but should any serious aversion

be shown the pulp may be mixed with a little sweet gravy or made into a jelly. As soon as tolerance has been established, the dose of the pulp may cautiously be augmented until the child can take half a pound of meat in the course of the twenty-four hours. At first the stools are apt to be somewhat increased in number and accompanied by a horrible odour of decomposition; but in the course of time, and especially if pepsin along with an antiseptic is administered after each meal, the motions assume a more natural appearance. The only danger attendant upon the use of uncooked meat lies in the possible introduction of some intestinal parasite; but careful selection and examination of the meat are usually sufficient to prevent this accident. It is a great mistake to discard the meat pulp as soon as the infant shows signs of improvement, for it too often happens that the premature resumption of milk or starchy foods is followed at once by a serious relapse.

The use of a diffusible stimulant is indicated in all cases which exhibit a tendency to exhaustion or heart failure. As a rule, the white wine whey, when given in dessertspoonful doses, meets all requirements, but under exceptional conditions recourse must be had to good pale brandy, whisky, burgundy, or champagne. The brandy may advantageously be combined with egg, as in the brandy mixture of pharmacopœia.

Both koumiss and kéfir are spoken favourably of by certain writers, but as a rule their effects are disappointing.

Of late years sour milk prepared after the manner recommended by Metchnikoff has been extensively used in the treatment of chronic diarrhœa in children. As a rule, half a pint, given in divided doses each day and continued for several weeks, exerts a most beneficial influence upon the disease, especially if the stools are green and malodorous. This preparation is, however, apt to produce vomiting and should be given with caution when emesis is a prominent

symptom of the case. In other instances 20 grains or more of the powdered lactobacilline mixed with diluted cow's milk and sugar answers very well, but I have never seen any decided improvement follow the use of the lactic acid ferment made in tablet form.

Medicinal.—The principles which should regulate the medicinal treatment of the disease are essentially the same as those adopted in the acute form of the complaint. If the diarrhœa is not urgent, and the stools contain lumps of undigested food which are passed with pain and straining, it is advisable to administer a purge, in order to rid the bowel of its irritant contents. For this purpose castor oil, calomel, or rhubarb and soda may be employed, the first-named being usually the most satisfactory. Even in cases where the motions are liquid and passed with a moderate degree of frequency, small doses of the castor-oil mixture with perchloride of mercury, or calomel (one-eighth to a sixth of a grain), or grey powder (quarter to half a grain), given every three or four hours, are attended by beneficial results. After these measures have been persevered with for a day or two, active antiseptic treatment should be commenced. The generally accepted treatment of chronic diarrhœa consists in the administration of various astringent drugs which are supposed to exert a local effect upon the mucous membrane of the bowel, and to prevent the escape of fluid from its vessels. Accordingly, text-books are usually full of prescriptions containing such substances as sulphuric and nitric acids, hæmatoxylin, chalk, coto-rhatany, catechu, tannic or gallic acid, alum, sulphate of copper, acetate of lead, etc. Some of these drugs possess an undoubted value when applied directly to the mucous membrane in the form of rectal injections; but their routine administration in relatively minute doses by the mouth is both unscientific in theory and valueless in practice. The inutility of the ordinary "diarrhœa mixtures" in the

chronic complaint of infancy must be patent to anyone who is in the habit of dealing with such cases; and from my own experience I can affirm that I have never seen a case cured by astringents in which a careful trial of antiseptics and sedatives had previously failed. On the other hand, it is a common experience to meet with cases where the substitution of rational methods of treatment for the empirical use of astringent drugs is followed at once by immediate improvement. Certain combinations of tannin and albumin have recently come into use, such as Tannalbin (grs. 8), Honthin (grs. 5–8), Tannigen (grs. 3), Tanocol (grs. 7), all of which have been highly spoken of by various authorities. Three drops or more of the liquor Ferri Pernitratis, diluted with water, and given every three hours, often succeeds when all other remedies have failed.

Of the various antiseptics, resorcine is, without doubt, one of the most useful, owing to its ready solubility, cheapness, sweet taste, and non-poisonous character. It must, however, be given frequently and in full doses (3 to 5 grains), and may advantageously be combined with carbonate of bismuth. As a rule, the intestinal flux begins to abate after the eighth dose, and the continued administration of the drug is not infrequently followed by obstinate constipation. In other cases, carbolic acid, creasote, iodine, or perchloride of mercury may be tried. When vomiting is severe, the salicylate of bismuth (3 to 5 grains), either alone or combined with a minute dose of calomel, is attended by remarkably good results; or the salicylate of strontium (1 to 3 grains) may prove successful when everything else has failed. Benzol-naphthol is of service when the large bowel is the chief seat of the disease, but it must be given in full doses (5 to 8 grains, every four hours) in order to produce a good effect.

It seldom happens that the diarrhœa arising from simple catarrh of the intestine cannot be controlled by one or

other of these drugs. In very chronic cases, however, the symptom more often depends upon secondary follicular ulceration of the large bowel than upon simple catarrh of the smaller gut, and in these cases sedative remedies are to be preferred to antiseptics. A small dose of Dover's powder combined with carbonate of bismuth and chalk usually answers well, or the tincture of opium may be used along with one of the mineral acids. This latter prescription is particularly useful in those cases where the diarrhœa is lienteric in character, or where the stools are habitually green in colour. Ipecacuanha is often a valuable remedy, and may be given either in the form of the powder or the wine; but it must always be combined with some aromatic or stimulant preparation in order to counteract its depressant effects. In some instances it is most efficacious when minim doses of the wine are given every hour; while in others minute doses of the powder (one-sixteenth to one-eighth of a grain) combined with Dover's powder and chalk or bismuth, appear to answer best. When severe vomiting follows each effort at defæcation, antimonial wine in minim doses every hour is often attended by success or 3 minims of Vanadine may be given after meals. In the most severe cases, where tenesmus is associated with the passage of blood and slime or prolapse of the rectum, an enema of opium and starch containing a small dose of ipecacuanha given twice a day is of great value; while in obstinate cases daily irrigation of the large bowel may be undertaken. For the due performance of this operation, the patient should lie upon his left side, with the buttocks raised, and the fluid should be allowed to flow into the bowel at the atmospheric pressure. Simple warm water (temp. 55° F.) or a dilute solution of common salt (½ per cent.) acts as a sedative to the inflamed mucous membrane, and aids in the removal of the acid mucus or other irritant material which may be present. Sometimes weak solutions of acetate of lead (½ per cent.),

nitrate of silver (1 grain per ounce), alum (1 grain per ounce), or salicylate of sodium (5 grains per ounce) may be employed with advantage.

As soon as the immediate symptoms of the complaint have completely subsided, the exhibition of tonic remedies is indicated. The bland preparations of iron are particularly useful, though occasionally the perchloride is more beneficial. Nux vomica and arsenic are valuable drugs at this stage of the complaint, and may advantageously be combined with a bitter infusion. In cases where the digestion continues feeble during the period of convalescence, the glycerin of pepsin, Holadin, or maltine may be administered immediately after the meals. Cod-liver oil should not be given as long as any tendency to diarrhœa exists.

(2) THE DYSPEPSIA OF OLD AGE

After sixty-five years of age functional disorders of digestion become extremely common, and even when no abnormal symptoms exist old people usually suffer from an enfeebled or capricious appetite and find that they can only avoid indigestion by the observance of a limited dietary. As the result of a laborious statistical inquiry into the relative frequency of various forms of dyspepsia at different periods of life, Samuel Fenwick found that 21 per cent. of all persons over sixty-five years of age suffered more or less from chronic indigestion. My own investigations, while generally confirming this estimate, have been more directly concerned with the causation of the digestive complaints met with in advanced life, and seem to indicate that out of every 100 cases of chronic dyspepsia in persons over sixty-five years of age sixty-six are secondary to organic disease of some important organ of the body, while the remaining thirty-four owe their symptoms to a progressive degeneration of the secretory structures of the stomach and intestines. In the former class the disorder of digestion usually takes

the form of a chronic gastritis due to disease of the kidneys, prostate gland, heart, lungs, liver, pancreas, chronic gout, or inefficient mastication, while in about seven of the sixty-six cases, or in 10·6 per cent. of the entire number, long-continued hypersecretion due to chronic ulcer in the vicinity of the pylorus, gall-stones, or diseased appendix is the cause of the chronic indigestion. The true dyspepsia of old age, which depends upon a series of retrograde changes in the alimentary tract, has hitherto received little or no attention, and I am consequently obliged to rely upon my own observations for the following notes upon the subject.

Pathology.—Some years ago, while pursuing with von Recklinghausen a histological investigation of stomachs taken from persons who had died from different complaints, I was much struck by certain morbid appearances presented by the organ in the case of old persons who had died either from accident or some acute disease and in whom the other viscera of the body were quite healthy. Further investigations have fully confirmed these earlier impressions, and it is now quite certain that with advancing age a progressive degeneration affects the secretory structures of the entire digestive canal. Although after the age of fifty these changes are fairly constant, careful examination will often detect their existence at a much earlier period, and in one instance they were extremely well marked in a man in his forty-first year. To the naked eye the pyloric third of the stomach presents an attenuated appearance, the rugæ being practically absent and the mucous membrane abnormally smooth, pigmented in patches, and firmly adherent to the subjacent muscular coat. The pyloric orifice is also less patent than usual and readily tears when stretched. In more advanced cases glistening lines or streaks may be observed running parallel to the lesser curvature, or irregular patches of thin, scar-like tissue are scattered over the mucous membrane near the pylorus. In such

it is usual to find that the walls of the stomach are so thin and white as to resemble tissue-paper, while from the size of the organ it is obvious that a considerable degree of gastrectasis must have existed during life. Post-mortem digestion is rarely encountered. As a rule, the small intestine exhibits the same pallid, thin, and inelastic appearance, while the colon is distended with gas and unusually translucent. Extensive atheroma of the abdominal aorta, coronary and mesenteric arteries may usually be observed.

On microscopical examination of the pyloric region the first sign of disease is found to consist of an overgrowth of the connective tissue that surrounds and supports the tubular glands, with the result that the latter appear attenuated and unduly separated from one another. Even at an early stage of the disease the columnar epithelium which covers the surface of the mucosa and lines the mouth of the ducts has disappeared and the cells of the glands have lost their individual outlines and present a granular appearance. As the disease progresses the ever-increasing interstitial tissue twists, distorts, and finally compresses the glandular structures until their extreme fundi are merely represented by a series of minute cysts lined with a cubical endothelium. Finally these disappear and the mucous membrane is converted into a thin layer of fibrous tissue. Coincidently with these changes in the mucosa the submucous coat suffers from a similar but less intense form of cirrhosis, accompanied by an obliterative arteritis of its nutrient vessels, with the result that the intervening muscularis mucosæ becomes more or less destroyed by compression. At first the muscular tunic shows signs of hypertrophy, but sooner or later it also becomes involved by an interstitial fibrosis and its contractile fibres either atrophy or are affected by fatty degeneration. Unlike the similar condition which results from ordinary interstitial gastritis, indications of hyperæmia are absent and the peritoneal coat

is never thickened. The cirrhotic changes rarely extend beyond the central zone of the stomach; indeed, the connective tissue of the fundus is usually very thin and fragile in appearance, while the glands are either dilated and devoid of cells or are incompletely filled by globules of fat. In the small intestine the villi are markedly shrunken and distorted, and the follicles of Lieberkühn are filled with masses of degenerated cells, while in advanced cases the mucous membrane is more or less completely destroyed by an interstitial fibrosis. Changes of a similar character are almost always present in the colon, and the head of the pancreas is usually atrophied or fatty.

If one may argue from the somewhat similar changes which affect the gastrointestinal tract in cases of chronic interstitial nephritis, pernicious anæmia, and diabetes, it would seem probable that the atrophy of the alimentary organs which occurs in old age is an expression of a mild, chronic toxæmia, the poisons of which produce irritation during their elimination by the glands of the gastric and intestinal mucous membranes, and are themselves possibly produced by some abnormal chemical changes in the contents of the large bowel.

With regard to the chemistry of digestion in advanced cases, I have usually found that the total acidity of the gastric contents after a test-breakfast is less than normal and varies between 30 and 45. Free hydrochloric acid is never met with and the proteid acid is also diminished in amount. Lactic acid is never present. The motility of the stomach also becomes much impaired, but undigested food is never found in the viscus in the early morning.

Symptoms.—The dyspepsia of old age is common to all classes of the community, but is rather more frequent in women than in men. It usually develops between sixty and seventy years of age and gradually increases in severity with advancing years. As a rule, the symptoms commence

in an insidious manner, but occasionally their onset is somewhat abrupt and dates from an accident or an acute illness. Flatulence invariably constitutes the most prominent symptom of the complaint. On rising from bed in the morning a sense of fullness, weight, or distention is usually experienced in the upper part of the abdomen, accompanied, perhaps, by nausea, giddiness, or palpitation, and not infrequently followed by an attack of retching which serves to expel a quantity of odourless gas from the stomach. As time goes on it is noticed that the appetite for breakfast steadily diminishes and articles of food which were previously enjoyed are renounced one after another until a piece of toast or a few thin slices of bread-and-butter constitute the entire meal. At midday the desire for food is more pronounced and a fairly substantial meal may be taken with relish, but during the afternoon epigastric discomfort, eructations of gas, and a marked disinclination for mental work manifest themselves. With the progress of time the sense of general discomfort becomes gradually augmented and it is found that abdominal distention and gaseous eructations are almost constantly present, although the individual himself may be oblivious of the noisy belchings or borborygmi which annoy his acquaintances and distress his relatives. Occasionally pyrosis, preceded by a cramping pain in the epigastrium, is a troublesome symptom, but regurgitations of an acid fluid into the throat are rarely the subject of complaint. Nausea and retching after food are by no means infrequent, but vomiting is seldom observed. Palpitation of the heart, flushing of the face, tightness of the chest, and a difficulty of inspiration are common in stout persons and greatly add to the general distress. The flatulence is often particularly severe at night and for some hours the patient may be obliged to sit up in bed and make frequent and varied efforts to expel the gas from his stomach. These nocturnal attacks are particularly common in persons who partake

of a light meal of liquid or semi-solid material before going to bed. The bowels are always sluggish in their action and the stools are hard, deficient in colour, and evacuated with difficulty. Anal prolapse develops in many instances, but piles are rarely met with.

These symptoms may exist in varying degrees of severity for many years, during which the individual maintains his physical strength in a surprising manner and suffers only slight loss of weight. He usually finds, however, that breathlessness ensues upon exertion and that mental worry, anxiety or physical fatigue will at any time induce a severe attack of flatulence. Very gradually the indications of intestinal disturbance manifest themselves, and when these become established the failure of nutrition at once attracts attention. Week by week the body diminishes in weight, the lips and conjunctivæ become pallid, the skin loses its elasticity and presents a dry, scurfy appearance, and there is a rapid deterioration of both the physical and mental powers. The patient now constantly wakes about 5 o'clock in the morning with colicky pains in the left side of the abdomen, and a call to stool results in the expulsion of much flatus and perhaps a little opalescent fluid. In some cases, and more especially in men, the pressure of the distended intestines upon the bladder induces a frequent desire to micturate, while the passage of flatus is often attended by dribbling of urine. The constipation which had previously been a marked feature of the case is interrupted by attacks of diarrhœa, which although not severe are productive of great debility and are followed by further impairment of the appetite and persistent dryness of the tongue. These symptoms, while they continue to exhibit a progressive character, are relieved to some extent by a residence in a bracing locality, careful dieting and cheerful companionship, but are exaggerated by a damp atmosphere and by indulgence in liquid food. In some instances

cardiac failure or an attack of diarrhœa brings life to a sudden termination, but as a rule death ensues from general exhaustion.

Treatment.—The treatment of senile dyspepsia is essentially the same as that adopted in cases of achylia gastrica and atrophy of the stomach. Mastication must be performed in an efficient manner, and fresh teeth should be inserted when necessary. The state of the mouth also requires careful attention and a wash of Condy's fluid or of carbolic acid or other antiseptic should be employed after each meal. Special precautions must be taken to protect the patient from cold, and it is advisable that a woollen or flannel band be worn next the skin of the abdomen both summer and winter. Fluids always increase the tendency to flatulence and consequently beef-tea, broths, and soups should be avoided, and only a small quantity of hot water be allowed at the end of the meal. Tea always disagrees and the various sweet preparations of cocoa usually excite gastric fermentation, but a palatable drink may be made from the cocoa husks. Some individuals are able to take peptonized cocoas and coffee without discomfort. The addition of a tablespoonful of brandy or whisky to the hot water taken after meals often allays the epigastric discomfort, but wines and malt liquors must be avoided. Effervescent drinks are particularly injurious. The fact that subacidity always exists in these cases renders it necessary to restrict the diet to finely minced white fish, chicken, game, brains, tripe, sweetbreads, calf's feet, eggs, or scraped raw meat. Green vegetables and most fruits increase the indigestion, but cauliflower, seakale, stewed celery, asparagus, and mealy potato may be permitted in moderation, or a baked or stewed apple may be taken with the midday meal. Toast is preferable to bread, and buns, cake, and pastry must, as a rule, be prohibited. Raw milk should be given with caution and in many cases it requires to be diluted with

lime-water, mixed with a small dose of citrate of sodium, sterilized or peptonized before the patient can take it without discomfort. Fats may be allowed if desired, and occasionally cod-liver oil is of great benefit.

The various digested and semi-digested cereal foods, maltine, and sanatogen, help to vary the diet, but oatmeal, barley, and rice should be given with caution.

The main indications for medicinal treatment are to correct the subacidity and to relieve the flatulence and constipation. For the former it is customary to prescribe dilute hydrochloric acid after meals, with pepsin, papain, or other artificial digestives, but given in the usual way the mineral acid rarely affords any benefit, while pepsin and its allies are useless. A better plan is to administer half a tumblerful of 0·1 per cent. solution of hydrochloric acid half an hour before meals. As a rule, the greatest aid to gastric digestion is the introduction of lactic acid bacilli into the stomach, in the form of milk curdled by means of Metchnikoff's lactobacilline. If this is prepared properly and a tumblerful or more of the curd be taken twice a day for a few months, many of the dyspeptic phenomena vanish and the flatulence is relieved or entirely removed. The various tabloids containing lactic bacilli sold in this country are, according to my experience, of very little value. Maltine and takadiastase are of use in certain cases of intestinal dyspepsia and should be given with the meals. Tonics always increase the flatulence, and even the various bitters prescribed with a view of increasing the appetite usually disagree after a few days. In order to relieve an attack of flatulence, a draught containing ether, ammonia, and spirits of cajuput is usually employed, but a far better remedy for the purpose is to be found in the alcoholic essence of peppermint introduced by Ricqlès and now obtainable at most of the large chemists in London. One teaspoonful in a sherryglassful of water seldom fails to

relieve the excessive distention or an attack of wind colic. For the constipation salines and mineral waters should be avoided, and recourse be had to the mixture of maltine and cascara, the confection of senna and sulphur, an infusion of senna pods, or an occasional dose of grey powder. Paraffin is apt to destroy the appetite.

CHAPTER IX

DYSPEPSIA DEPENDENT UPON DISEASES OF OTHER ORGANS

(1) Lung Disease; (2) Tuberculosis; (3) Heart Disease; (4) Liver Disease; (5) Kidney and Urinary Diseases; (6) Specific Fevers; (7) Syphilis; (8) Diabetes; (9) Anæmia and Chlorosis; (10) Nervous Diseases; (11) Pregnancy; (12) Drugs

THE stomach is the great sympathetic organ of the body whose functions are at once disturbed when any other viscus is attacked by disease. In the case of the heart and liver, obstruction to the portal circulation is the immediate cause of the failure of gastric digestion; in nervous affections, as well as in disorders of the blood-making organs, a perversion of the gastric secretion is usually encountered, while in specific fevers, Bright's disease, syphilis, phthisis, and diabetes organic changes occur in the mucous membrane of the digestive tract as the result of the special toxæmias that develop in these complaints. It is obvious, therefore, that no trustworthy opinion can ever be expressed as to the cause of dyspepsia unless all the important organs of the body have been examined and their various functions investigated as carefully as those of the stomach itself.

(1) LUNG DISEASES

Emphysema gives rise to a downward displacement of the stomach, and is therefore frequently accompanied by symptoms of gastroptosis (Chap. VI). At a later stage of

the pulmonary complaint, as well as in cases of chronic interstitial pneumonia and pneumonoconiosis, the gradual dilatation of the right side of the heart induces congestion of the stomach and a disorder of digestion similar to that met with in valvular disease. Empyema, abscess of the lung, and bronchiectasis are apt to be accompanied by chronic inflammation of the stomach and intestines owing to absorption of toxins from the diseased tissues. Of all pulmonary diseases, however, tuberculosis is infinitely the most important, and the varieties of dyspepsia that are met with in this complaint are worthy of a detailed description.

(2) THE DYSPEPSIA OF PHTHISIS

Two forms of indigestion are commonly observed during the course of chronic phthisis, one of which, the initial variety, coincides with the deposition of the tubercle and continues until cavitation occurs, while the second, or terminal dyspepsia, accompanies the final stage of the disease and is due to chronic gastroenteritis.

Morbid States of the Stomach in Phthisis.—*Dilatation* of the stomach is a very frequent accompaniment of chronic pulmonary tuberculosis, and, indeed, it is rare to perform a necropsy on a case of this nature without encountering some increase in the dimensions of the organ.

Louis estimated that two-thirds of his cases of phthisis exhibited evidences of dilatation of the stomach, while among 100 necropsies on cases of a similar nature at which I took special notes on this point the lower margin of the viscus extended below the level of the navel in sixty-four. In fifty-eight instances the pulmonary disease had existed for some considerable time and the lungs presented numerous excavations with more or less fibroid induration. In the remaining six cases the tubercular disease was of more recent origin. It may also be noticed that in six out of

seven cases of acute miliary infection no obvious increase in the size of the stomach could be detected.

It would thus appear that the degree of gastrectasis bears a direct relation to the extent and chronicity of the pulmonary lesion—a fact which is borne out by clinical observation.

The inner surface of the organ often presents numerous irregularities which were first described by Louis under the term " état mamelonné." In this condition the mucous membrane is closely beset with a large number of minute elevations arranged in the form of patches or streaks in the neighbourhood of the pylorus. Occasionally the whole of the interior of the stomach is affected in a similar manner, or in rare cases the fundus alone presents any appearance of the disease. Sometimes these excrescences attain a considerable size and form hemispherical or polypoid tumours attached to the surface by a short stalk (Chap. IV).

This abnormal condition of the mucous membrane owes its origin to the contraction of newly formed fibrous tissue situated between the secreting tubules, and is analogous to the nodular appearance of the liver or kidney in cases of chronic interstitial inflammation of these organs.

Mammillation of the stomach is said to be of frequent occurrence in cases of phthisis, but in the post-mortem records of the Brompton Hospital I found it was only observed in about 4 per cent. of all cases.

Various forms of *ulceration* of the stomach are encountered in chronic phthisis. In some instances the lesion is obviously of old standing and in no way connected with the lung complaint. In others the disease appears to have originated a short time before death, while occasionally the ulceration owes its origin to the same cause as that which produced the pulmonary mischief.

The simplest variety of ulceration is the so-called *hæmorrhagic erosion*. It has already been shown that minute

effusions of blood are apt to occur in the mucous membrane of the stomach shortly before death owing to congestion of the organ from failure of the right chambers of the heart. If, however, life be prolonged for a few hours and the gastric secretion is active, these punctiform hæmorrhages undergo digestion and become converted into actual abrasions. The fully developed erosion presents the appearance of a small circular ulcer surrounded by a slightly elevated and tumid ring of pale yellow colour. The base of the ulcer is shallow and is usually formed by the deeper layers of the mucous coat, but sometimes the muscular tunic is laid bare.

Occasionally the inner surface of the stomach is found to be studded from the cardiac to the pyloric orifice with numerous small circular ulcers, several centimetres in diameter (Paulici, Steiner, Rilliet and Barthez). This variety seldom extends deeper than the muscular coat of the organ, but sometimes the serous membrane may be exposed. The edges are sharp and often undermined, the base smooth and somewhat yellow in colour, while the surrounding tissue appears highly injected with blood.

No tubercles can be discovered, and the microscope fails to demonstrate any specific cause for the disease.

This form of gastric ulcer is often encountered in children who have succumbed to general tuberculosis, but I have never observed it in adults. It is possible that it occurs some days before death as a result of hæmorrhage into the mucous membrane.

In many cases of pulmonary tuberculosis the mucous membrane of the stomach presents numerous small *follicular* ulcers which vary in size from a few lines to 2 cm. in diameter. The edges of the excavation are slightly raised and either of a pale yellow colour or surrounded by a zone of highly injected capillaries. The disease seldom extends deeper than the submucous coat, but occasionally the mischief appears to be progressive, when the base of the

ulcer may involve the muscular or even the serous tissue. This variety of ulceration was noticed by Wilson Fox in 12 per cent. of his acute and 18 per cent. of his cases of chronic pulmonary tuberculosis. It is particularly apt to occur in children who have succumbed to acute miliary tuberculosis, and among 10 consecutive cases of this disease which I examined at the Evelina Hospital, well-marked follicular ulceration was present in four.

It is by no means uncommon to find a *simple chronic ulcer* in the stomach of a person who has succumbed to pulmonary tuberculosis; and, indeed, so often do the two diseases coexist that some writers have attempted to establish a causal relationship between them. But it is probable that undue stress has been laid upon this point and that the frequency with which the two affections are associated is more apparent than real. Thus, Dittrich only found four open ulcers in 403 necropsies on cases of phthisis, and among 1,000 post-mortem examinations performed at the Brompton Hospital I could only find the presence of a gastric ulcer noted in nine instances. Occasionally several *shallow* ulcers are formed in the immediate vicinity of the pylorus. This condition is usually associated with lardaceous disease of the vessels in this region and is apparently due to the slow digestion of the mucous surface in consequence of its deficient blood supply.

Ulceration of the stomach resulting from *tuberculous disease* is very seldom encountered. Louis never met with an example and Andral only mentions two. After a careful search I have been able to discover the records of twenty-four examples, several of which are, however, open to suspicion; while among the notes of 2,000 necropsies on cases of phthisis performed at the Brompton Hospital I could only find two instances in which the disease was encountered.

The great rarity of tuberculous disease of the stomach appears to depend upon two principal causes. In the first

place, unlike the intestine, the stomach only contains a small amount of lymphoid tissue, which is deeply situated in the substance of the mucous coat. In the second, the acid secretion of the organ, though it may not actually destroy the bacilli, is distinctly inimical to their growth, and hence, even when they are introduced in large quantities into the stomach by means of swallowed expectoration, they are rendered temporarily inert and are passed into the small bowel without having effected a permanent lodgment.

Gastroenteritis.—The first accurate description of the histological changes met with in the stomach in cases of chronic phthisis is to be found in the writings of Fox, Jones, Samuel Fenwick, and Habershon, although Louis, Andral, Stokes, and many others at an earlier date had published excellent accounts of the macroscopic appearances of the disease. Of late years Marfan, Schwalbe, and several other Continental pathologists have added to our knowledge of the subject.

The various writers differ considerably among themselves as to the frequency with which the stomach is affected by inflammation in pulmonary tuberculosis. Wilson Fox found the disease existed in about 62 per cent. of his cases of phthisis, while Lebert had previously noted its presence in about one-fifth of his chronic and one-eleventh of his acute cases.

Marfan's description of the disease is based upon an examination of the stomach in twenty-seven cases of phthisis, in eighteen of which (66 per cent.) he was able to detect signs of inflammation. Schwalbe examined twenty-five cases, and of these fourteen (56 per cent.) presented appearances of chronic catarrh, while only six were described as normal.

My own observations were conducted upon fifty cases of pulmonary tuberculosis taken haphazard from the post-

mortem room, in forty-two of which the microscope demonstrated organic changes in the mucous membrane of the stomach and intestines.

The chief results of these observations, as regards the stomach, are shown in the following table, where it will be observed that an inflammatory affection of the gastric mucosa is chiefly met with in cases which exhibit cavitation of the lung.

Similar evidences of chronic interstitial inflammation may be detected throughout the whole length of the intestine,

Condition of lung disease	No of cases	Interstitial gastritis	Parenchymatous gastritis	Lardaceous disease
Miliary tuberculosis .	10	—	2	—
Caseous tubercle (without cavities) . .	13	2	1	—
Tubercle with cavities	27	23	6	8

and in advanced cases the villi of the duodenum present the same degree of cirrhotic atrophy as occurs in the gastro-enteritis of infancy (Fig. 13).

Several writers have suggested that the gastroenteritis of phthisis arises from septic absorption from the lung (Stokes, Pollock, Marfan), and this conclusion seems to be warranted by the following facts: (1) The disease only occurs during the last stage of phthisis after vomicæ have been formed. (2) It is usually associated with an intermittent form of pyrexia suggestive of septic absorption. (3) In those cases where the tuberculous disease becomes arrested the gastric complaint also subsides. (4) The simultaneous affection of several organs (stomach, intestine, kidney, pancreas, salivary glands) by a similar pathological change indicates the existence of a general cause. (5) The same variety of inflammation is apt to occur in cases of bronchi-

ectasis and caries of the spine or hip associated with long-continued suppuration.

Marfan and Bréville have been able to isolate a chemical substance from the pulmonary cavities in cases of phthisis which possessed toxic properties when injected into animals, though it did not appear to produce any noticeable change in the mucous membrane of the gastrointestinal tract. Before I was acquainted with the work of these observers, I had undertaken an investigation of a somewhat similar nature. Large quantities of expectoration were obtained from cases of phthisis which presented the physical signs of excavation along with the symptoms of gastritis, and immediately mixed with an excess of absolute alcohol. After a lapse of several weeks the material was filtered through linen, and the semi-solid residue extracted with distilled water and added to the original filtrate, the whole being afterwards evaporated to a small bulk *in vacuo* at a temperature of 38° C. The syrupy liquid obtained in this manner was then thrown into a large excess of absolute alcohol, and the coagulated proteids separated by filtration and again extracted with distilled water. This process was repeated several times, and finally the alcoholic precipitate was collected and dried *in vacuo*. In this manner a yellowish-brown powder was obtained, which was easily soluble in distilled water, of a neutral or slightly acid reaction, and possessed of the general chemical properties of proteose matter. When this substance was injected into animals in the proportion of 0·1 gram to 0·3 gram per kilo of the body weight, it was followed by convulsions, and death often ensued from respiratory failure within half an hour. The necropsy revealed intense congestion of the whole of the gastrointestinal tract with numerous hæmorrhages both there and in the substance of the kidney. Repeated injections of the toxic substance gave rise to chronic gastro-enteritis, but never produced lardaceous disease.

(i) The Initial Dyspepsia

(*a*) *Frequency.*—Hutchinson was the first to publish an accurate statement concerning the frequency with which the symptoms of indigestion accompany the development of pulmonary tuberculosis; earlier writers having been content to express themselves in more general terms. This observer found that dyspepsia was present in 92 per cent. of the cases he investigated, and that in no fewer than 55 per cent. of these the complaint proved severe. These results were subsequently confirmed by Dobell; while Samuel Fenwick estimated that 83 per cent. of his patients at the Victoria Park Hospital suffered from digestive disorders during the early stages of their pulmonary disease. Pollock noted a similar condition in ninety-seven out of 113 cases of rapid phthisis, and more recently Marfan has recorded that 61 per cent. of his cases of pulmonary tuberculosis suffered from symptoms indicative of indigestion.

My own observations were conducted at the Brompton Hospital, and were based upon a personal examination of 500 cases of phthisis, half of which were males and half females. In each instance the facts were elicited as far as possible without the employment of leading questions, and the results were recorded along with a diagram representing the physical condition of the lungs and the stomach at the time of the examination.

The various facts obtained in this manner are exhibited in the following table, and will be more especially noticed when the symptoms of the complaint are dealt with in detail. In the meantime it is only necessary to state that as a general result of my investigations, dyspeptic phenomena of sufficient severity to attract the attention of the patient are encountered in about 70 per cent. of all cases of early phthisis, but that the development of the disorder in any individual case depends to a great extent upon the sex of

MALES

Condition of lung disease	No. of cases	Previous dyspepsia	Dyspepsia present	Pain	Vomiting	Acidity	Flatulence	Dislikes	
								Fat	Sugar
Miliary tuberculosis .	4	—	2	2	1	—	2	2	—
Consolidation . .	78	7	41	38	18	39	26	32	4
Excavation . .	168	32	42	20	12	17	21	87	11

FEMALES

Miliary tuberculosis .	5	—	2	2	1	—	2	3	—
Consolidation . .	96	65	81	74	49	51	63	58	9
Excavation . .	149	121	93	36	32	28	32	94	12

the patient, the type of the tubercular disease, and the previous condition of digestive organs.

(*b*) *Influence of Sex.*—Dyspepsia appears to be much more frequent in the female than in the male. Thus, I found that among the ninety-six cases of women who were admitted with signs of recent consolidation, no fewer than eighty-one (84 per cent.) complained of dyspepsia; while among the seventy-eight men who presented similar signs of disease, only forty-one (52 per cent.) were affected with a disturbance of digestion. The symptoms of the complaint are also apt to differ in the two sexes, women being more frequently affected with flatulence and vomiting and men with pain and acidity.

(*c*) *Influence of the Type of the Lung Disease.*—The most typical instances of dyspepsia are encountered in that variety of pulmonary tuberculosis which commences insidiously and progresses slowly.

In cases of miliary disease, gastric symptoms are usually present at the outset, and, according to the statements of Pollock, almost every case of acute phthisis is accompanied

by troublesome indigestion. But in both these varieties of the lung disease, the rapid progress of the primary mischief soon produces a train of symptoms so severe as to eclipse completely those arising from a functional disturbance of the stomach; and it is not surprising that a patient, whose main desire is to obtain relief from his laboured respiration or respite from his cough, should neglect such trifling symptoms as flatulence and acidity. On the other hand, in the more chronic forms of the complaint, when cough and dyspnœa are as yet undeveloped, the patient is apt to concentrate his attention upon his increasing failure of strength, and will consequently blame his deficient powers of digestion as the principal cause of his weakness and loss of flesh and feel most acutely any symptoms that arise during the process of food assimilation.

(*d*) *The Existence of Previous Dyspepsia.*—Among my series of cases, 72 per cent. of the females and 17 per cent. of the males had suffered at one time or another from moderate or severe indigestion; and since it has already been shown that females are more prone to exhibit the symptoms of dyspepsia in early phthisis than members of the opposite sex, it would seem that a previous attack of indigestion predisposed to the complaint.

Symptoms.—*Pain.*—This forms one of the most constant features of the disease and is present to a noticeable degree in about 92 per cent. of all cases.

It is usually described as a sensation of weight or uneasiness rather than actual pain, but in some cases a considerable amount of suffering is experienced. The symptom usually makes its appearance almost immediately after the meal, but it may be delayed for half an hour to two hours. At the commencement of the disease pain may only follow the evening meal; but as the disorder progresses it gradually becomes more frequent. In the majority of the cases the sensation is referred to the chest rather than to the abdomen,

and often appears to be situated under the lower end of the sternum slightly to its left side. In other instances, it is the cardiac region which is more immediately affected, and when pain in this locality is combined with attacks of palpitation, the patient will often seek advice on account of a supposititious affection of the heart. The cause of the pain varies with the secretory activity of the stomach. When, as is usually the case, the production of hydrochloric acid is diminished, the discomfort experienced after meals is due to stagnation and fermentation of the food. In other cases where hyperchlorhydria exists the symptom is attributable to irritation of the gastric mucous membrane.

Vomiting.—This usually shows itself in the first instance when the patient arises from bed in the morning, and is preceded by a tickling sensation in the throat and severe cough. Retching follows directly upon a violent expiratory effort which is necessary to dislodge and expel a small quantity of sticky secretion from the pharynx or bronchial tubes, and if the stomach happens to contain any food or an excess of mucus, this is rejected at the same time. Occasionally, when the retching has been severe, a small quantity of bilious or even blood-stained fluid may be vomited. It is to be noticed that the attack is neither preceded nor accompanied by nausea, giddiness, or faintness, and possesses no tendency to spontaneous recurrence, while the patient is often able to partake of breakfast without further discomfort.

In other instances, or at a later period in the same case, another variety of vomiting occurs. At first sight this appears to be directly excited by the ingestion of food, and takes place most frequently after the evening meal. Careful observation, however, usually shows that in this case, also, the vomiting is preceded and caused by cough. In severe cases, every attempt to partake of food is followed by an attack of coughing which terminates in vomiting, and the patient, though he feels himself growing steadily weaker,

fears to indulge his appetite on account of the discomfort which invariably follows.

Disorders of Appetite.—In this variety of dyspepsia, there is usually a marked repugnance to all kinds of *fat*, that belonging to mutton, beef, veal, or pork being especially distasteful. Thus, Hutchinson found that 71 per cent. of his cases of phthisis disliked all kinds of fats; 33 per cent. could take it in small quantities, while only 5 per cent. liked it. Among my own cases, marked aversion to fat was noticed in 64 per cent.; of this number the dislike had been acquired at the commencement of the dyspepsia in 39 per cent., but had existed throughout life in 61 per cent. It is noteworthy that in the latter class the repugnance to fatty substances had increased with the development of the dyspepsia, and that in the majority of the cases one or more members of the patient's family had succumbed to phthisis.

These results are in close accord with the statements of Edward Smith, who found that 44 per cent. of his cases of phthisis disliked all kinds of fat, while in only 37·7 per cent. was it palatable. This writer also states that 28·8 per cent. specially disliked bacon fat, 6·6 per cent. butter, and only 0·23 per cent. milk. Many of my patients, on the contrary, were able to eat bacon when they possessed the greatest abhorrence of other kinds of fat meat.

In some cases, during the early stages of the gastric disorder, *saccharine* substances are apt to disagree and therefore become distasteful. Among the cases investigated by Hutchinson, 29 per cent. disliked sugar of all kinds, and about 8 per cent. of these had acquired the aversion after the onset of the pulmonary disease. Dobell found that sugar disagreed in 37 per cent. of the cases he examined. According to my experience, about 20 per cent. of the female sufferers from this complaint and 7 per cent. of the male have an objection to sweet articles of food, but in

the majority a want of relish was more apparent than actual aversion, while in many the symptom had existed since birth. On the whole, it would seem that in about 7 per cent. of all cases the patient loses his relish for saccharine substances when the first symptoms of the gastric derangement manifest themselves. In rare instances *alcohol* appears to disagree, and a man who had previously indulged freely in wine or spirits will lose all desire for these beverages or even actively dislike them. This symptom, however, is by no means common and is more frequently encountered in private than in hospital practice.

When the dyspepsia has become well established, many patients develop a craving for certain substances toward which they had previously been either indifferent or ill-disposed. It is usually the acid or bitter materials which enjoy the greatest popularity and raw fruit, lemons, or sour oranges are devoured with avidity. Occasionally these tastes become decidedly morbid, and a patient will consume the contents of a vinegar cruet during a single meal or even drink the acetous fluid out of a spoon. Sometimes jam is devoured in large quantities and with extreme relish when nothing else can be found to tempt the capricious appetite.

Reflex Cough.—This is an exceedingly common symptom of the dyspepsia of early phthisis and has long attracted attention under the name of " stomach cough," or " toux gastrique."

Soon after a meal, especially if the food taken has been somewhat excessive in amount or difficult of digestion, the patient is seized with a severe attack of coughing which usually terminates in the expulsion of the contents of the stomach. Sometimes the cough comes on without warning, but usually it is preceded by a sense of irritation at the back of the throat or base of the tongue. The explanation of this phenomenon is probably to be found in an increased

sensibility of the gastric mucous membrane associated with an abnormal excitability of the respiratory centre.

Flatulence exists in 72 per cent. of the cases, and is rather more frequent in women (80 per cent.) than in men (62 per cent.). *Acidity* is present in 45 per cent.

Constipation is an almost invariable symptom of the complaint, and proves rebellious to treatment. The evacuations are pale and fœtid and contain an excess of undigested food. Occasionally the fæces are coated with a thick layer of mucus which induces the patient to believe that he is the subject of worms. Attacks of diarrhœa are apt to occur from time to time, and become frequent as the disease of the lung shows a tendency to the formation of cavities.

The *tongue* is large, flabby, and often indented along its margins by the teeth. The buccal secretions are acid, and the incisor and canine teeth often undergo rapid decay. Some patients complain of extreme thirst at night-time, but this is seldom a noticeable feature of the complaint.

Anæmia is always present in a marked degree, especially in women, and the *catamenia* are scanty and irregular, or even entirely suppressed.

Occasionally the skin of the neck, breast, axillæ, or that in the region of the cervical spine presents an excess of pigment, and this, if it be combined with gastric phenomena of a severe character and extreme weakness, may lead to a mistaken diagnosis of Addison's disease.

The degree of fever that accompanies the pulmonary disease does not appear to exercise any decided influence upon the severity of the gastric complaint. Special observations made on twenty-seven cases with reference to this point showed that seventeen exhibited little or no pyrexia during the day, while the remaining ten suffered from continued fever.

Gastrectasis.—Among my 122 cases of dyspepsia associated with physical signs of recent consolidation of the lung,

twenty-eight, or about 23 per cent., presented some evidence of enlargement of the stomach, the lower border of the organ extending as far as the navel or below it, while in four instances the degree of gastrectasis was very considerable. It is probable, therefore, that about 20 per cent. of the cases exhibit some degree of dilatation of the stomach. This estimate falls far short of that of Marfan, who was able to discover either atony or dilatation of the organ in every case which he examined.

Chemistry of Digestion.—Klemperer found that in the majority of his cases of early phthisis the gastric secretion was either normal or somewhat increased, and Immermann and Schetty have arrived at similar conclusions. Brieger, on the other hand, states that in incipient phthisis the secretion of hydrochloric acid is practically normal, while in moderate cases of the disease it is reduced in 60 per cent., normal in 33 per cent., and absent in 6·6 per cent. Hildebrandt considers the formation of the acid depends upon the temperature of the body, since he found it existent in apyretic cases but absent in those accompanied by fever. He also noted the reappearance of the acid when the temperature had been reduced by antipyrin. These observations have not been confirmed by Schetty.

The motor power of the stomach diminishes when the tuberculous deposits in the lung undergo softening, and, according to Brieger, is always reduced when the secretion of hydrochloric acid fails.

Course and Termination.—The course of the initial dyspepsia is very variable, and, as a rule, its symptoms are gradually replaced by those which attend the terminal stage of the pulmonary complaint. There are, however, three facts of importance connected with this variety of dyspepsia in phthisis. In the first place, the indigestion may constitute the sole *symptom* of the lung complaint, and the tuberculous mischief may proceed to the formation

of large cavities without giving rise either to cough or expectoration. Secondly, the dyspepsia often amends or alters in type as the phthisis progresses ; the pain and vomiting either subsiding when cough and night-sweats become troublesome, or the symptoms of myasthenia of the stomach and bowel are replaced by those of chronic gastroenteritis. Lastly, if the pulmonary complaint becomes arrested the dyspepsia usually diminishes or disappears.

(ii) The Terminal Dyspepsia

The advent of the final stage of the tubercular disease is often heralded by a recurrence of the dyspepsia which had proved so troublesome a symptom at the onset of the lung complaint. Once more the patient experiences discomfort after his meals, with nausea and occasional vomiting ; while attacks of diarrhœa come on at short intervals and prove extremely exhausting. As a rule, this variety of dyspepsia does not attract much attention, being completely overshadowed by the pulmonary symptoms ; but sometimes the cough and expectoration remain latent, and the gastric disorder constitutes the sole cause of complaint. In several instances which have come under my notice, phthisis was never suspected until a few days before death, while in others the lungs were found to be riddled with cavities at the necropsy to the great astonishment of the medical attendant, who, owing to the absence of the ordinary pulmonary symptoms, had regarded the disease as simple gastritis.

Among my 316 cases of pulmonary tuberculosis which presented the signs of excavation, 135, or 42·5 per cent., suffered from dyspepsia of sufficient severity to attract notice. Women appear to be more liable to the complaint than men, for, while 62 per cent. of the female subjects of chronic phthisis exhibited symptoms of a gastric derangement, only 25 per cent. of the males suffered in a similar manner.

Symptoms.—The *appetite* invariably diminishes with the progress of the disease. At first it is capricious, and the patient may exhibit the same fanciful tastes as in the earlier stages. Occasionally the signs of a false appetite are present in a very marked degree, and a feeling of intense hunger will suddenly be replaced by a loathing of food when a few mouthfuls have been swallowed. As the complaint advances anorexia increases, though in rare instances the patient may retain his relish for food until the last, or may even suffer from extreme hunger. As a rule, the distaste for fat persists during the whole course of the pulmonary complaint, and eventually even butter and cod-liver oil cannot be tolerated owing to the nausea and discomfort which follow their ingestion. It is a curious fact, however, that many patients appear to lose their antipathy to meat fat as the final stage of the disease approaches, and a few even acquire a certain amount of relish for some varieties.

About 57 per cent. of my cases suffering from this form of dyspepsia were unable to eat fat, and 8 per cent. disliked sugar.

Thirst is a frequent though not invariable symptom. It may exist only at meal times, but it is more commonly complained of in the intervals of taking food. The sensation is usually relieved most readily by drinking cold water, but sometimes hot or acid liquids are preferred.

Painful sensations at the epigastrium, occurring either spontaneously or as a result of an effort of digestion, are comparatively rarely encountered in this form of dyspepsia. Among my 135 cases of the disorder, only fifty-six, or 41 per cent., exhibited this symptom.

When it occurs, the pain usually shows itself within five to thirty minutes after the meal, and varies from a sense of oppression and discomfort to one of intense burning over the epigastric and cardiac regions, or between the shoulders. Deep pressure with the hand usually tends to increase the suffering, but sometimes it affords distinct relief.

Contrary to the usual statement that *vomiting* is a constant feature of the gastritis of phthisis, only 32 per cent. of my cases exhibited this symptom. Occasionally an attack of coughing occurs shortly after a meal, and terminates in the rejection of the contents of the stomach, but this accident is much less frequent than in the earlier stages of the pulmonary disease.

When vomiting constitutes a well-marked feature of the complaint, it occurs at irregular intervals and often in the early morning before any food has been taken. *Nausea* is an almost constant symptom and may persist for many hours after the emesis. The ejecta are sour and contain an excess of mucus, and occasionally consist entirely of this material. Hæmatemesis is extremely rare, but occasionally small quantities of blood are vomited during a severe attack of retching.

Flatulence and *acidity* were noted in about 30 per cent. of the cases, and usually coexisted with nausea and vomiting.

The *bowels* are usually irregular in their action at the commencement of the complaint, periods of constipation alternating with sharp attacks of diarrhœa. Toward the last, however, the bowels are relieved every hour or two, and the exhaustion which arises from this symptom materially hastens the fatal termination.

In the early stages the *tongue* is usually redder than normal and presents a bright red tip and a dorsum covered in a patchy manner with yellow fur. Later on the surface of the organ acquires a morbidly red and shining appearance or it becomes dry in the centre with aphthous patches along its tip and edges.

Physical Examination.—The exact determination of the outline of the stomach in these cases is often a matter of some difficulty, owing to the rigid state of the abdominal wall and the pain which accompanies palpation and percussion.

In cases of moderate severity the stomach almost always exhibits some evidence of dilatation and the lower border may be found to reach as far as the navel or slightly below it. As the pulmonary disease advances the area occupied by the organ becomes progressively increased, and at a late stage the greater curvature may extend several inches below the level of the umbilicus or even reach as far as the pubes.

Out of 317 cases of chronic phthisis associated with vomicæ, I found that 273, or about 86 per cent., showed signs of dilatation of the stomach, and in every one of the 135 cases which suffered from dyspeptic symptoms the characteristic splash could be obtained at or below the level of the navel.

Chemistry of Digestion.—The *peptic ferment* continues to be secreted by the stomach until the mucous membrane has received permanent damage from the attacks of sub-acute inflammation which occur during the final stage of pulmonary tuberculosis, and an artificial juice prepared from these cases usually exhibits a considerable degree of activity. When, however, the secreting structures have become the seat of diffuse fibrosis or lardaceous disease, the artificial juice is found to exert little or no action upon fibrin or albumen.

With regard to the secretion of *hydrochloric acid*, there is still a considerable divergence of opinion. Schetty states that he could discover no marked alteration in the quantity of the free acid in the various cases which he examined, while Immermann was able to detect its presence even in advanced cases of phthisis accompanied by severe pyrexia. Hayem and Einhorn seem to regard the secretion as extremely irregular, while Klemperer found that free acid gradually disappeared from the contents of the stomach as the pulmonary disease progressed. In thirty-four cases of advanced phthisis investigated by Brieger, hydrochloric acid was

normal in 16 per cent., absent in 9·6 per cent., and diminished in the remainder.

When the mucous membrane of the stomach is attacked by lardaceous disease, the secretion of hydrochloric acid rapidly fails and soon ceases altogether (Cahn and von Mering, Edinger, Riegel).

The motor power of the stomach always shows signs of weakness in these cases (Klemperer), and absorption as determined by the method of Penzoldt is invariably delayed.

In almost every case gastric fermentation is active, and its various products can easily be recognized by appropriate means.

Course and Termination.—When once the terminal dyspeptic symptoms have shown themselves in a case they usually persist until death. The tongue becomes dry and is attacked with thrush, the discomfort after food gradually increases, anorexia becomes complete, and the patient succumbs either to extreme exhaustion or to some accident connected with the pulmonary complaint. It is, however, important to note that if the tuberculous disease undergoes temporary arrest the gastric phenomena usually exhibit a corresponding remission, while a cure of the phthisis is almost invariably followed by diminution of the dyspepsia. This latter phenomenon is frequently observed, and I have the notes of several cases of chronic fibroid phthisis of eight to twelve years' duration, in which the main symptoms of indigestion were completely absent, though the stomach still showed signs of considerable dilatation.

Treatment.—This should be conducted upon the lines laid down for cases of chronic gastritis (Chap. IV). When vomiting after meals is a prominent symptom of the complaint, the patient should be kept in bed and fed principally upon milk. Soured milk, kéfir, and koumiss are often useful. Greasy and fatty foods almost always excite disgust, and should therefore be used with caution or even

withheld altogether. In like manner, highly spiced or sweet articles of diet usually prove unpleasant. The vomiting from reflex cough is best combated by the administration of a bismuth mixture containing a small quantity of morphine or nepenthe or by the use of codeine jelly. Occasionally a tumblerful of hot water taken before meals reduces the liability to this symptom. Vomiting after meals must be treated by gastric antiseptics and alkalies. Constipation always requires consideration, and the action of the bowels should be regulated by small doses of mercury and chalk, cascara sagrada, or by the aloes and iron pill. Diarrhœa may be controlled by the use of salicylate of bismuth, resorcine, or other intestinal antiseptics.

(3) DISEASES OF THE HEART

In uncomplicated cases of valvular disease the functions of the stomach are rarely disturbed, and, as a rule, the secretion of hydrochloric acid continues normal; but when dilatation of the heart occurs the portal system becomes congested and the stomach suffers in consequence. After death from gradual cardiac failure, the stomach appears to be much thickened and heavier than usual, while its inner surface is purple in colour and covered by a thick layer of tenacious mucus. The removal of the latter shows that the rugæ of the organ are increased in size and that the mucous membrane is studded with hæmorrhages which vary from the size of a millet seed to that of a two-shilling piece, while here and there ante-mortem digestion of these infiltrated areas has given rise to superficial ulcers. Occasionally the surface is rough and gritty, owing to the deposition of phosphatic salts. Microscopical examination reveals an excessive congestion of all the veins and capillaries of the organ, especially of those which ramify between the peptic glands and in the submucous coat. The pressure exerted by these enlarged blood-vessels causes the gastric tubules

to present an irregular, compressed, or twisted appearance, while in some parts of the section their outlines are quite obscured by interstitial hæmorrhages. Both the central and the parietal cells are swollen, their nuclei are obscured, and occasionally fatty degeneration of their protoplasm can be detected (S. Fenwick). Mitral stenosis, either congenital or acquired during early life, is always associated with gastro-coloptosis.

The gastric secretion varies with the degree of portal congestion. During the early stages of cardiac failure free hydrochloric acid can usually be detected in the contents of the viscus after a test-meal, but is absent if a large quantity of food has been administered. Thus, Heuffler found an absence of the free acid after a large test-meal, while Einhorn, Adler, and Stern, who employed a light test-breakfast, were able to demonstrate its presence in two-thirds of their cases. Of the twenty-three examples of failure of the heart examined by van Valzah and Nisbet, five showed normal secretion; thirteen, diminished secretion; and five, a complete absence of free hydrochloric acid. As the acid diminishes the peptic and rennet ferments also fail, but these, like the acid, become augmented if the cardiac muscle regains its normal tone.

In advanced cases the motility of the stomach is impaired, its absorptive capacity is diminished, and stagnation of the food occurs. Of the various secondary fermentations which ensue, that which gives rise to an acetone odour of the breath and the formation of di-acetic acid in the stomach is the most interesting and important, since its presence almost invariably denotes the advent of anorexia and gastric intolerance.

Symptoms.—Even when compensation is complete, the subjects of valvular disease usually experience a sense of oppression at the chest and flatulence after meals, which become gradually more severe as the right side of the heart

undergoes dilatation. In such cases sudden and excessive distention of the stomach and intestines is apt to occur, which has the effect of displacing the heart upward and causing faintness or even fatal syncope. In other instances, violent palpitation is experienced after each meal, accompanied perhaps by giddiness and marked irregularity of the pulse. At a more advanced stage of the cardiac complaint, anorexia usually develops and the patient may express the greatest loathing of nourishment of any kind. This symptom is one of considerable importance, since it not only leads to voluntary starvation with consequent enfeeblement of the heart's action, but is often an indication of impending death.

In almost every instance vomiting ensues from the congestion and secondary inflammation of the stomach, and has the effect of preventing both the administration of food and also of digitalis and other medicines. When emesis is a frequent symptom, the skin and conjunctivæ are usually slightly jaundiced, the breath possesses the odour characteristic of acetone, and the urine is greatly reduced in amount. Giddiness and somnolence are constantly complained of, sleep is fitful, and the bowels are irregular in their action. The vomited material usually consists of bile-stained mucus, but occasionally it contains traces of altered blood, while in rare instances a severe or even fatal hæmatemesis may occur. On examination of the abdomen the epigastrium is found to be distended and tender to pressure, the stomach slightly dilated, while the entire liver is enlarged and the urine usually contains albumin. According to Leared, the stools often contain an excess of fat.

Treatment.—Digitalis is invariably required, but if vomiting is severe the drug should either be given by the rectum or administered in the form of a pill combined with mercury. Digalen sometimes agrees when other preparations cannot be prescribed, or recourse may be had to hypodermic injections of Nativelle's digitaline. In all cases where the

drug is given by the mouth it is advisable to replace it every fortnight with a short course of rhubarb and soda, combined with a brisk mercurial purge. Occasionally, the application of a dozen leeches over the liver or venesection will immediately relieve the vomiting and increase the beneficial action of the digitalis. Excessive flatulence after meals may be combated by the administration of an alkaline medicine containing carbolic acid and a diffusible stimulant, and in the dangerous attacks of syncope that occur during digestion an enema of turpentine is often of great value. In other respects the treatment is identical with that of chronic gastritis (Chap. IV).

(4) DISEASES OF THE LIVER

The anatomical and physiological relationships that exist between the liver and the stomach are sufficient to explain the frequency with which the digestive functions are deranged in hepatic diseases.

Obstruction of the portal circulation, such as occurs from the pressure of a tumour, thrombosis of the vein, or chronic perihepatitis, produces the same effects upon the stomach as chronic dilatation of the heart and leads to a gradual failure of the gastric secretion. Simple enlargement of the liver is a frequent cause of a vertical displacement of the stomach, whereby motor insufficiency with its attendant evils is induced (Chap. VI). Lardaceous disease is associated with a similar condition of the gastric mucosa and anacidity of the secretion. Hypertrophic cirrhosis is accompanied by discomfort after meals, flatulence, acidity, constipation, and other symptoms that ensue from the coexistence of hyperchloracidity (van Valzah). Gall-stones are attended by hyperchlorhydria in about 60 per cent. of all cases, and in even a larger percentage by hypersecretion. During an attack of the colic the first few specimens of vomit usually contain free hydrochloric acid, but subsequently they

consist entirely of bile-stained, alkaline mucus. As a rule, the hyperacidity diminishes or disappears after the elimination of the stone, while its persistence usually indicates that other calculi exist in the gall-bladder or biliary ducts. Hyperchlorhydria is also frequently met with in cases of catarrhal jaundice.

Atrophic cirrhosis of the liver is invariably associated with chronic interstitial and parenchymatous gastritis, which owes its origin to the same cause as the hepatic disease. Subsequently the inflammation of the stomach becomes complicated by the venous congestion arising from portal obstruction, and not infrequently severe hæmorrhage ensues from the varicose veins around the cardiac orifice.

The organic affections of the stomach that arise from diseases of the liver include stenosis of the pylorus or duodenum from adhesion of the gall-bladder or from pressure of a hydatid, gumma, or cancerous tumour. In the former case the signs of gastric dilatation are often accompanied by chronic hypersecretion, while in the latter the characters of the gastric juice vary with the nature of the primary complaint.

(5) DISEASES OF THE KIDNEYS AND URINARY ORGANS

Inflammation of the kidneys is always accompanied by a similar affection of the stomach and intestines, the histology of which varies with the type of the renal disease. Thus, in acute parenchymatous nephritis the gastric tubules as well as the glands of the intestine are found to be swollen, irregular, and filled with granular and disintegrated cells. With a large white kidney a chronic inflammation of the glandular structures of the stomach and bowel is encountered, and the peptic cells exhibit fatty degeneration; while in cases of chronic interstitial nephritis the mucous membrane of the gastrointestinal tract undergoes a form of fibrosis owing to inflammatory thickening of the interglandular connective

tissue. Similar changes to these occur in the sweat glands of the skin (S. Fenwick). Occasionally small hæmorrhages appear in the mucous membrane of the stomach, or superficial ulcers of considerable size may develop. Sloughing ulcers are also met with in the colon. The cause of this gastroenteritis in kidney disease is to be found in the vicarious excretion of urea and other poisons by the digestive organs, and in almost every case urea may be detected in the contents of the stomach and in the stools. In animals I found that the subcutaneous administration of urea was followed at once by the appearance of the salt in the stomach, while continued injections gave rise to chronic inflammation of the gastrointestinal tract. The sweat glands also excrete urea and likewise undergo inflammation and gradual destruction.

The renal insufficiency that results from enlargement of the prostate, stricture of the urethra, or obstruction of the ureters is accompanied by similar though less severe changes in the stomach and intestines.

The activity of the gastric secretion seems to vary in different cases. Van Valzah and Nisbet believe that hyperacidity is common in the early stages of the complaint, and that diminished acidity subsequently develops. Zipkin found hyperacidity more common than anacidity, and Krawkow observed normal acidity in four, hyperacidity in fourteen, and anacidity in eight out of his twenty-six cases. Biernacki studied twenty-five examples of Bright's disease, including both the acute and chronic forms of the complaint. From his observations he concluded that the secretion of gastric juice is always reduced in disease of the kidneys, but that the degree of reduction varies considerably in different cases. He also found that the amount of free hydrochloric acid is usually reduced in proportion to the extent of the œdema, the degree of albuminuria, and the amount of urine secreted. The pepsin and rennet ferments

are always diminished in amount and often disappear entirely. The motor power of the stomach is usually increased, and secondary fermentations are comparatively rare. In cases of uræmia the vomit is often alkaline in reaction and may contain carbonate of ammonium owing to decomposition of urea in the stomach.

Symptoms.—In the chronic forms of kidney disease a disturbance of digestion is often the sole subject of complaint, and in the absence of a careful examination of the urine the gastroenteritis is apt to be regarded as a primary disorder. The symptoms vary at first according to the nature of the secondary gastritis. Thus in parenchymatous nephritis the inflammation of the tubular glands of the stomach is accompanied by vomiting, constipation, and pain after food, while the interstitial gastritis that accompanies the granular contracted kidney gives rise to loss of appetite, nausea, flatulence, emaciation, and an irregular action of the bowels. Vomiting in kidney disease, like that which results from other toxæmias, occurs both in the early morning and after meals. In the former case nausea is experienced as soon as the patient rises from bed, and after much retching a little alkaline mucus tinged with yellow bile and mixed with saliva is rejected. Emesis after meals may occur either at once or be postponed for an hour or two, and the ejecta then consist of undigested food, mixed with an excess of mucus and almost devoid of hydrochloric acid. Sooner or later the stools become frequent and loose in character, and progressive loss of flesh occurs. If the kidney trouble shows signs of amelioration the symptoms of dyspepsia also improve for a time.

The onset of acute uræmia is almost invariably marked by an access of vomiting and pain in the head. Emesis occurs at frequent intervals, is excited by every attempt to swallow food, and in many cases an extreme degree of gastric intolerance is displayed. The ejecta usually consist of bile-

stained mucus, but occasionally they are composed of a thin, alkaline fluid which smells strongly of ammonia (Frerichs). In some instances diarrhœa is the most prominent symptom, and the stools are copious, frequent, and stained with blood, while their evacuation is attended by griping pains. They may possess a strong odour of ammonia. Lancereaux has drawn attention to a peculiar form of pharyngitis that occurs in cases of uræmia, and Barie has observed stomatitis associated with a profuse secretion of saliva containing nearly 1 per cent. of urea. Long-continued *obstruction to the passage of urine* from prostatic or other disease is invariably accompanied by an extremely troublesome disorder of digestion. The subjects of this complaint are usually somewhat emaciated and suffer from deficient circulation in the hands and feet. Whatever food they take is at once followed by fullness and oppression at the epigastrium and chest and by excessive flatulence. The appetite is defective, but thirst is increased. At first the tongue is slightly furred, but it gradually becomes dry and red. The secretion of saliva is markedly diminished, and the buccal cavity and pharynx present a glazed appearance. Subsequently vomiting and diarrhœa develop and the case eventually succumbs either to exhaustion or to some complication of the urinary disorder.

Treatment.—Milk should form the staple diet, and if necessary may be peptonized or mixed with lime-water. Suitable aperients must be administered in order to procure a liquid action of the bowels each day, and for this purpose a saline draught in the early morning or a dose of compound powder of jalap is to be preferred. When the secretion of hydrochloric acid is increased a mixture containing the carbonates of bismuth and sodium, combined with glycerin and carbolic acid, may be given between meals, but at a late stage of the complaint dilute hydrochloric acid with pepsin is of greater value. Diarrhœa must be combated

by the administration of salicylate of bismuth, guaiacol, or other intestinal antiseptics. If an urethral stricture exists, it should be dealt with at once; or if enlargement of the prostate is responsible for the retention of urine, a catheter should be regularly employed or the gland removed by operation.

(6) SPECIFIC FEVERS

The observations made by Beaumont were the first to indicate that in febrile conditions the secretion of gastric juice is diminished and the processes of food digestion greatly retarded. Examination of the gastric contents withdrawn by a tube in cases of fever have produced somewhat contradictory results, since, while Ewald noted a failure of the secretion of hydrochloric acid, Ueffelmann detected an increase, Sazzezki, Edinger, and Gluzinski found that the quantity varied in different cases, and von Noorden discovered that he could stimulate the production of the mineral acid by the administration of condiments and spices. My own observations seem to indicate that the functional activity of the stomach in febrile diseases depends chiefly upon its freedom from inflammation. Thus, in scarlatina, which was shown by Samuel Fenwick to be invariably accompanied by severe parenchymatous gastritis, the secretion of hydrochloric acid is usually annulled until the end of the first week, and a similar condition is often found in cases of smallpox. In measles and pneumonia, which rarely exhibit any organic changes in the digestive tract, the gastric secretion shows little or no perversion; while in enteric fever the gastric tubules appear quite healthy when examined by the microscope, but the lymphoid tissue of the mucous membrane is much increased and occasionally ulcerates. In fatal cases of pertussis numerous petechiæ are found in the stomach intermixed with hæmorrhagic erosions, and in certain cases of diphtheria the inner surface

of the stomach is found to be covered with false membrane (Smirnhow, Fenwick).

Symptoms of dyspepsia are encountered in many specific fevers, and are particularly pronounced in scarlatina and smallpox, the onset of which is often marked by severe and protracted vomiting. Vomiting also accompanies the spread of diphtheritic membrane to the stomach, and is frequently provoked by the paroxysmal cough of pertussis. In measles, vomiting and diarrhœa are notable features at the crisis.

In all febrile conditions the secretion of saliva is diminished; the tongue and mouth become dry and foul, and occasionally an ascending infection of Stenson's duct leads to suppurative parotitis. The appetite is always deficient, and in those diseases which are accompanied by acute gastritis the greatest aversion from food may exist. A similar dislike is sometimes observed in pertussis; but in this disorder it can usually be traced either to failure of the heart or to a fear lest the ingestion of food should excite a fit of coughing. Severe pain after meals is seldom experienced, and the subjective sensations that arise from maldigestion in the stomach consist for the most part of discomfort, oppression at the chest, distention, and flatulence. Occasionally, however, the subjects of influenza suffer from genuine epigastric pain, and a similar condition is sometimes met with in pertussis and enteric fever. In one case that came under my care fatal hæmatemesis occurred during the third week of typhoid fever from follicular ulceration of the stomach. The signs of gastrectasis are seldom observed except in typhoid and other febrile conditions of long duration. In such cases flatulence is often a conspicuous symptom and both the stomach and intestines are constantly distended with gas. Nausea and palpitation are experienced after meals, and the pressure of the distended bowel upon the bladder gives rise to a frequent desire to micturate. This gastrointestinal complaint may continue during the whole

period of convalescence and is sometimes accompanied by an enlarged and fatty liver. Chronic dyspepsia of the atonic type is apt to follow both measles and enteric fever, and may so injuriously affect the general nutrition as to favour the inception of tubercle.

Malaria also exerts an important influence upon the digestive system, and is occasionally responsible for the development of an ulcer of the stomach or duodenum. In certain malarious districts gastralgia is said to be exceptionally frequent, and periodical attacks of hæmatemesis, curable by quinine, may accompany the variety known as pernicious ague (Hemmeter).

(7) SYPHILIS

Secondary syphilis, according to Fournier, is often accompanied by symptoms of disordered digestion, prominent among which are epigastric pain after meals, loss of appetite, and vomiting. These phenomena rarely last for more than a week or two and are rapidly cured by the judicious administration of mercury. They appear to arise from a toxæmic gastritis peculiar to the disease.

Tertiary syphilis may affect the stomach in three ways: (1) by the formation of gummata; (2) by the production of endarteritis, and (3) by exciting chronic inflammation of its mucous membrane.

(1) *Gummata.*—A *gumma* of sufficient size to attract attention is rarely encountered. Chiari observed only three instances in 243 necropsies upon persons suffering from syphilis, and in all about sixteen genuine examples are recorded in the literature of the subject. The tumour, which is often multiple, is usually situated in the submucous tissue of the pyloric region near the lesser curvature. It is round and somewhat flattened on the surface, yellowish in colour, firm on section, and varies from 3 to 7 cm. or more in diameter. At first the mucous membrane which covers it

is stretched and thin, but, as the nodule increases in size and its substance undergoes softening, it usually becomes destroyed and an ulcer is produced. A gummatous ulcer consequently presents certain features which serve to distinguish it from the simple variety. In shape it is often irregular, scalloped, or even triangular; its edges are thickened and undermined; while its walls and base are shaggy, cheesy, hæmorrhagic, or covered with a firmly adherent yellow slough. Spironemas have been demonstrated in the base of the ulcer (McNee). The mucous membrane in the vicinity of the neoplasm, or its resultant ulcer, exhibits signs of chronic inflammation and is not infrequently studded with minute gummata. Perforation of the stomach has not been observed, although in a case recorded by Lancereaux this accident was prevented only by the presence of a cheesy nodule. It is important to observe that in all these cases manifestations of syphilis were present in the other abdominal viscera, the liver, pancreas, spleen, or lymphatic glands presenting gummata or cicatrices. In cases of congenital syphilis in newly born infants the small intestine is particularly apt to suffer and small gummata may be found scattered throughout its length or congregated about the ileocæcal valve. Similar conditions have also been described in the fœtus (Bittner).

(2) *Endarteritis.*—Obliterative endarteritis affecting the gastric vessels must not be regarded as necessarily an indication of syphilis. It may be observed in the fibrous base of nearly every chronic simple ulcer, and in not a few cases of long-standing perigastritis due to disease of some neighbouring organ. Its pathology is similar to that form of endarteritis which commonly accompanies cirrhosis of the lung and kidney, and in the case of a gastric ulcer its existence is of some value to the organism, since the gradual occlusion of the arteries which lie in the track of the advancing disease tends to prevent hæmorrhage. Syphilitic

endarteritis, on the other hand, is comparatively rare as a primary complaint, and, as far as my experience goes, is always associated with gummata in the liver, spleen, pancreas, or retroperitoneal glands. It chiefly affects the smaller branches of the pyloric vessels which ramify in the subserous and submucous connective tissue, and by diminishing the blood-supply to the part tends to induce inflammatory thickening of the mucous membrane and to give rise to interstitial hæmorrhages and superficial ulcerations. When the arterial disease is unusually severe or widely diffused, the nutrition of the gastric wall is so much reduced that the tissues are no longer capable of withstanding the solvent action of the gastric secretion, which consequently erodes the surface and gradually produces an indolent form of ulceration. In other cases the partially obstructed vessel becomes the seat of thrombosis, and the mucous membrane which it supplies, being suddenly deprived of blood, is rapidly digested. In the former case the patient suffers from the symptoms of chronic ulcer of the stomach; in the latter, from attacks of acute dyspepsia, which are not infrequently accompanied by hæmatemesis.

(3) *Chronic Gastritis.*—Chronic gastritis may ensue either as a direct or an indirect result of syphilis. The latter variety is by far the more common, and is due either to embarrassment of the gastric circulation from disease of the liver or spleen, to lardaceous degeneration of the vessels of the stomach, to secondary disease of the kidneys, or to the specific cachexia. This gastritis does not differ histologically from the ordinary varieties, and, like them, usually subsides when its exciting cause has been removed. Chronic inflammation of the stomach *directly* dependent upon the systemic infection occasionally results from repeated attacks of acute gastritis during the early phases of the complaint, such as have been described by Jullien and Fournier; but, as a rule, it appears only at an advanced

stage of the disease, and is usually associated with gummatous lesions of the bones, liver, or testes. To the naked eye the mucous membrane is either dull white and peculiarly opaque, or appears to be thickened and irregularly congested, with a surface like velvet pile. On microscopical examination the superficial roughness of the membrane is found to be due to an absence of the normal columnar epithelium and to a hyperplasia of the connective tissue between the mouths of the glands, which give the section the appearance of being covered with fine papillæ. The capillary vessels which ramify between the glands are dilated and filled with corpuscles; but here and there their outlines are obscured by an accumulation of small round cells, which pervade the whole of the connective tissue and form thick layers around the mouths and fundi of the glands. The lymphoid follicles are enormously enlarged, and their cellular elements frequently penetrate the muscularis mucosæ and the submucosa. The gastric glands vary in appearance at different parts of the section, at one spot being comparatively healthy, while at another they are twisted, distorted, or disorganized by the round-cell infiltration. These general features are common to all forms of interstitial gastritis, from whatever cause they arise, but in the present case two special phenomena exist which indicate the syphilitic origin of the disease. The first of these takes the form of miliary granulations, which occupy the whole thickness of the mucosa and may even invade the submucous tissue or project slightly above the free surface. These nodules, which are really minute gummata, consist for the most part of a homogeneous, granular, non-staining material, and where several have coalesced a large portion of the section may consist entirely of this cheesy material in which spironemas may be detected. The other characteristic feature of syphilitic gastritis is a hyperplasia of the inner coats of the small arterioles situated in the submucosa, which pro-

duces considerable narrowing of their lumina and not infrequently leads to thrombosis. These arterial changes may be observed in any part of the section, but are always most noticeable in the vicinity of the miliary gummata.

Symptoms.—Chronic *ulceration* of the stomach due to syphilis is most common in men between twenty-five and forty years of age, in many of whom secondary symptoms of the infective disorder were either very slight or were rapidly removed by treatment. The gastric complaint usually develops slowly, and for several months may be mistaken for some form of simple or inflammatory dyspepsia; but sooner or later the characteristic symptoms of ulcer manifest themselves and become severe. So far as my own experience goes, these cases chiefly differ from the simple variety of the disease in three particulars, the first of which is the extreme severity of the pain and vomiting, the second the frequency of hæmorrhage, and the third their intractability to ordinary treatment and tendency to relapses.

Pain is invariably present, and, as is usual in gastric ulcer, is principally experienced in the epigastrium within half an hour after a meal containing solid food. In many instances, however, the suffering is almost constant, and even a diet of milk gives rise to oppression at the chest with distention and flatulence. When the disease has existed for some months the pain is often most intense during the night, when the stomach is devoid of food, and it may then extend all over the abdomen and chest and radiate down the extremities or up into the neck. Under these conditions, the epigastrium is usually very tender, and the cranium, the tibiæ, and the heels may also be unduly sensitive to pressure. The attacks last for several hours and are frequently accompanied by flatulence and acid eructations, burning in the throat, intense thirst, and vomiting. They are temporarily relieved by a draught of milk or a dose of bicarbonate of sodium, and more effectually by vomiting.

Rosanow diagnosed a syphilitic ulcer in one patient on account of the nocturnal pain, and successfully treated it, while Bartumeus lays stress upon the occurrence of emesis during the night; but since both these phenomena are met with in simple ulcer when complicated with hypersecretion, they cannot be regarded as pathognomonic of the specific form of the complaint. *Vomiting* is another conspicuous feature of the disease. At first the patient may be sick only during the painful crises, which the act of emesis tends to curtail; but as soon as secondary gastritis develops vomiting may occur after every meal, while from time to time attacks come on which last for many days and prevent the administration of nourishment by the mouth. The constant pain and vomiting soon induce a serious deterioration of the general health. The patient becomes very thin and feeble, and presents the pinched and careworn look of one who is always suffering. The appetite may remain good or even be excessive, but he is afraid to gratify his desire for food on account of the punishment which is sure to follow, while at intervals he is tormented by a thirst which no amount of water will subdue. The bowels are confined and the tongue is often covered with a white fur. The urine is diminished in amount and its reaction is often neutral or slightly alkaline, while in many cases it contains an excess of phosphates but is deficient in chlorides. Anæmia is invariably present, and the peculiar sallow complexion of many of the patients is very suggestive of a specific cachexia. About 70 per cent. of the cases suffer from hæmatemesis, and in some instances repeated attacks of hæmorrhage have been observed which only subsided after the employment of antisyphilitic treatment (Monod). The Wassermann reaction is always positive.

As a rule, the complaint fails to respond to the ordinary methods of treatment, and even when antisyphilitic remedies are employed it may exhibit a great tendency to relapse.

With regard to the chemistry of digestion there is very little evidence to offer. In the early stages of the complaint, free hydrochloric acid may usually be detected after a test-meal, and in those cases where nocturnal attacks of pain are present the vomit usually contains an excess of the mineral acid. But when the disease has given rise to great loss of flesh and to debility the signs of hypersecretion disappear and lactic acid may be detected. When vomiting is excessive the ejecta are often bile-stained and contain much mucus. The usual cause of death is exhaustion from inanition, but an intercurrent affection like tuberculosis or some syphilitic complication often hastens the fatal termination. Perforation appears to be rare. Among the sequelæ of the disease, pyloric stenosis is the most important, and has been recorded by Cornil, Wagner, and Klebs.

Gastritis occurs both in hereditary and acquired syphilis, and is chiefly characterized by its chronicity and intractability to ordinary treatment. In infancy and early childhood the intestine usually suffers along with the stomach, so that in addition to the vomiting there is either diarrhœa or obstinate constipation. In all cases the loss of flesh, anæmia, and debility are out of proportion to the severity of the local symptoms, owing to the consecutive atrophy of the gastric and intestinal glands, which can be demonstrated in almost every case of so-called "syphilitic marasmus." During the period of childhood intercurrent attacks of acute gastritis, characterized by incessant nausea and vomiting and occasionally by severe gastralgia, are apt to occur from time to time. The bowels are confined, the tongue is thickly coated, and slight delirium may appear at night. If no food can be retained in the stomach the disease may prove fatal; but, as a rule, the acute phase passes off in a few days, and is replaced by the chronic form. In almost every instance the child presents evidences of syphilis in the face, teeth, and eyes, while not infre-

quently the development of a gumma heralds the onset of an acute attack. In one case which came under my care a large mass could be felt for several months in the liver, and subsequently a gummatous swelling appeared upon the forehead; while in that reported by Hemmeter the child presented an enormous gumma of the lower jaw.

Mild forms of syphilitic gastritis occurring in adult life are practically indistinguishable from the alcoholic variety, while in the more severe cases the progressive loss of flesh, excessive debility, anorexia, and profound anæmia, coupled with an absence of free hydrochloric acid from the gastric contents, are highly suggestive of a malignant growth. More than one case of this description has come under my care in which, if it had not been for a positive Wassermann reaction, I should have diagnosed cancer of the stomach; and I have known several patients who were condemned to carcinoma of the stomach or pancreas after an exploratory incision, make a perfect recovery under anti-syphilitic treatment. Although traces of altered blood may appear in the vomit, severe hæmatemesis is rarely observed unless the liver or spleen is also diseased.

Treatment.—Absolute rest is essential, and much time will be saved if the patient is confined to bed for the first fortnight. Milk should form the staple diet for the first three or four weeks, but as it does not always agree so well as in simple ulcer it may be necessary to dilute it with soda-water or Vichy water. When vomiting is a troublesome symptom the milk should be peptonized. Clear soups, broths, jellies, and junket may also be allowed if the patient can take them without discomfort. After the first month should the case be progressing favourably, milk puddings, soft bread-and-butter, eggs, tripe, and oysters may be permitted, and the diet may subsequently be increased by the addition of pounded fish, finely minced sweetbreads, and chicken-cream. Meat and green vegetables should be

prohibited for at least six months. If vomiting is troublesome, it may be necessary to feed the patient by the rectum. When abdominal pain is severe the epigastrium may be constantly covered with a large linseed poultice, but, as a rule, the repeated application of a small blister is of greater value. With regard to medicinal treatment, it may be stated at once that salvarsan should be given a full trial when considered advisable. Mercury should always be combined with an iodide, since the latter is much less efficacious when given alone. In most instances it is sufficient to prescribe a mercurial pill of 2 grains, with an equal quantity of extract of hyoscyamus night and morning, but in some cases drachm doses of the solution of perchloride of mercury are to be preferred. In young children inunctions of mercurial ointment or full doses of mercury and chalk are the most convenient methods of administering the drug. If there is any tendency to diarrhœa, a small quantity of opium may be included in the prescription. The iodide of potassium or sodium must be given in doses of from 5 to 15 grains, and is most conveniently combined with carbonate of bismuth and liquid extract of sarsaparilla; while the addition of 10 minims of glycerin of carbolic acid often tends to relieve the oppression and flatulence which are experienced after meals. Should the bowels remain constipated in spite of the mercurial, a teaspoonful or more of the artificial Carlsbad salts may be given each morning before breakfast. Lavage is chiefly indicated in the cases of chronic gastritis accompanied by troublesome vomiting or where an ulcer has caused partial obstruction of the pylorus, but it should be avoided when symptoms of active ulceration are present.

(8) DIABETES

The subjects of diabetes are liable to several manifestations of indigestion, especially during the later stages of

the complaint. In most instances discomfort and abdominal distention occur an hour or two after meals, and large quantities of gas are eructated or evacuated by the bowel. Occasionally acidity is a prominent symptom. In all cases the bowels are confined, and the stools are dry, hard, and often coated with mucus. Attacks of subacute gastritis are apt to supervene in debilitated subjects, and are accompanied by loss of appetite, increased thirst, pain in the epigastrium, a furred tongue, and occasionally by vomiting. Violent abdominal pain precedes the development of coma in many instances, and is sometimes brought on by overexertion or excitement. It is usually ascribed to gastralgia, but in many of its features it closely resembles lead colic, and is probably due to a tetanic spasm of the colon induced by the toxæmia.

A study of the physiology of digestion in these cases has brought to light one or two facts of importance. Rosenstein examined ten diabetics and found the secretion of hydrochloric acid to be normal in four, while in six it was sometimes normal and sometimes diminished in quantity. In three cases which were examined after death chronic interstitial gastritis with atrophy of the gastric glands was discovered. Gans investigated ten cases, and found that the composition of the gastric juice had no relation to the amount of sugar eliminated. Free hydrochloric acid was present in six instances, but was absent in the other four. In the eight cases examined by Honigmann hydrochloric acid was diminished or absent in four, and the investigations of Rosenheim, Sée, and Krause afforded somewhat similar results. Both Honigmann and Gans noted that the motor power of the stomach was perfectly normal in cases of diabetes. In some of my cases the gastric contents contained a large percentage of sugar, and the administration of yeast by the mouth produced excessive distention and flatulence. It is, therefore, probable that the diminished

secretion of hydrochloric acid, which is often met with, encourages the fermentation of the saccharine fluid excreted by the gastric mucous membrane, and thus produces the distention and other symptoms of diabetic dyspepsia. Subsequently the products of fermentation excite chronic interstitial gastritis, which, if it terminates in extensive atrophy of the peptic glands, produces the failure of gastric secretion and the cachexia which sometimes manifest themselves in the last stage of the disease. When insulin treatment proves successful the symptoms of indigestion gradually subside.

(9) ANÆMIA AND CHLOROSIS

These two conditions must be carefully distinguished from each other. *Anæmia* is characterized by a deficiency of red corpuscles, with perhaps an increase of the white cells, and is caused by direct loss of blood, hæmolysis, or by some other affection which reduces the quantity of blood in the circulation. In *chlorosis*, on the other hand, the hæmoglobin is chiefly diminished, and the blood corpuscles show comparatively little change. When these primary distinctions are borne in mind, it is not surprising to find that the two complaints are accompanied by different disorders of digestion.

Anæmia.—Animals suffering from the effects of venesection were found by Korczinski and Jaworski to exhibit a deficient secretion of hydrochloric acid, and Manassein obtained similar results from his experiments on dogs. The observations of Buzclygan and Gluzinski upon the subjects of severe hæmorrhage are somewhat contradictory in character, but they seem to demonstrate a uniform absence of hydrochloric acid in persons affected with malarial cachexia. Pineau and others have noted the existence of achylia in pernicious anæmia. The type of dyspepsia which accompanies anæmia varies according to the cause of the blood

disorder. Thus, when the anæmia is due to kidney disease, phthisis, or malaria, a secondary gastroenteritis occurs, which is responsible for vomiting and diarrhœa; in pernicious anæmia atrophy of the stomach gives rise to severe attacks of emesis, flatulence, and anorexia; in the cachexia of syphilis the diminished blood supply of the gastric mucous membrane often produces symptoms of ulceration, while after a severe loss of blood the resultant indigestion exhibits the general characters of that which ensues from subacidity.

Chlorosis.—In this disorder the secretion of hydrochloric acid is more often increased than diminished. It is true that Ritter and Hirsch found the gastric juice deficient in several cases, while Schneider noted anacidity in 54·2 per cent. of those which he examined, but the more recent inquiries of Grüne, Osswald, Hayem, and Schätzell throw considerable doubt upon the accuracy of these earlier observations.

Thus, in the seventy-two cases examined by Hayem the amount of hydrochloric acid was normal in two, excessive in forty-two, and diminished in twenty-eight; Schätzell detected hyperacidity in twenty-two out of his thirty cases, and Riegel states that in the majority of the chlorotics under his care the mineral acid was in excess. The motor power of the stomach both in anæmia and chlorosis rarely suffers deterioration whatever be the state of the gastric secretion (Riegel).

Four principal forms of indigestion are met with in subjects of chlorosis. Most frequently the chief causes of complaint are distention and flatulence after meals, which arise from fermentation of the food and a deficient action of the bowels (Chap. III). In other cases severe pain is experienced immediately after food, vomiting is of frequent occurrence, and the entire region of the stomach is tender on pressure. This disorder is due to hyperæsthesia of the gastric mucous membrane and is readily cured by the

administration of iron and suitable aperients (Chap. V). Less often the symptoms of hyperacidity manifest themselves, and careful dieting is required to cure the complaint (Chap. II), while occasionally the gastric symptoms are dependent upon gastroptosis, accompanied, perhaps, by some perversion of secretion (Chap. VI).

(10) NERVOUS DISEASES

Most organic diseases of the brain, especially tumour, basic meningitis, hæmorrhage, and abscess, are accompanied by vomiting. This symptom is purely central in origin and is not associated with any demonstrable lesion of the stomach. The emesis itself exhibits no constant relation to the quantity or quality of the food, and often occurs when the stomach is empty, in which case severe retching merely relieves the organ of a little bile or mucus. In certain cases of cerebral tumour, attacks of vomiting occur at intervals and are preceded by severe headache, while the vomited material consists almost entirely of gastric juice mixed with bile and containing an excess of free hydrochloric acid. These phenomena are closely allied to those of acute hypersecretion and unless the optic discs be examined in every case which displays symptoms of this nature a serious error of diagnosis may be committed.

Certain affections of the spinal cord are also accompanied by gastric symptoms, prominent among which is locomotor ataxia with its well-known crises. Sahli and others have reported the existence of hypersecretion in such cases, but, as a rule, neither hyperacidity nor continuous secretion can be detected.

Certain psychoses are attended by an alteration of the gastric secretion. Thus, von Noorden found hyperchlorhydria frequent in melancholia with curtailment of gastric digestion; while in dementia, Leubuscher and Ziehen observed a marked diminution of gastric activity. Hysteria

gives rise to many secondary affections of the digestive organs, of which hyperæsthesia, anorexia, and hysterical vomiting are the most important. In the latter condition emesis usually takes place regularly after meals but does not destroy the appetite. It is also to be noticed that although vomiting is usually said to be excessive the patients never lose weight, from which fact it may be inferred that only a small portion of the contents of the stomach is rejected on each occasion. The chief effect of neurasthenia upon the digestive organs has already been described under the title of neurasthenia gastrica (Chap. V).

(11) PREGNANCY

Although pregnancy cannot be regarded as a morbid condition in the strict sense of the word, its effects upon the digestive system are of sufficient importance to merit a more detailed description than is usually accorded to them by writers upon disorders of the stomach. In most obstetrical works the dyspepsia of pregnancy is regarded as synonymous with " vomiting," and only the causation and treatment of this symptom are discussed. It must be obvious, however, to every clinician that sickness is by no means the only indication of dyspepsia occurring in pregnancy and that the cases which suffer from vomiting are often in a much happier condition than those who have to endure the less obtrusive but more uncomfortable phenomena associated with indigestion. There are three varieties, or " degrees," of digestive disturbance which require notice, namely, flatulent distention, occasional vomiting, and gastric intolerance or " pernicious vomiting."

(1) *Excessive flatulence* is chiefly encountered in women who never vomit. It usually commences about the sixth week and continues until the end of the eighth month. It is most frequent in neurotic and hysterical individuals and in those who have long suffered from some functional dis-

turbance of the digestion. It is also extremely common in the subjects of gastroptosis. As a rule, it takes the form of acute attacks, which recur every week or ten days and last from twenty-four to forty-eight hours, but occasionally the sense of abnormal distention is continuous and merely varies in degree.

An attack is ushered in by malaise, want of appetite, and oppression at the chest after food. At first the epigastric region is the chief seat of discomfort, but very soon the whole of the abdomen becomes distended, tense, and extremely tender. Nausea, giddiness, and palpitation soon develop, and the head may seem to be overfilled with blood. Within a short time belching of an odourless gas supervenes, but this only gives temporary relief and does not appear to diminish the gastric and intestinal distention. In other instances the constant passage of flatus is a troublesome symptom. The patient is unable to lie down owing to abdominal discomfort, and there may be an incessant desire to pass water. The bowels are always confined. The attack is followed by prostration and a feeling of soreness of the abdomen. The disorder differs from nervous eructation (Chap V) in that the signs of flatulent distention of the stomach and bowels are very conspicuous, while immense quantities of gas are eructated or evacuated by the rectum. If the woman is the subject of valvular disease of the heart, severe and even dangerous syncope may occur, but, as a rule, recovery ensues as soon as the distention abates. It is worthy of notice that fatigue, excitement, or a mental shock will invariably induce an attack.

(2) *Vomiting* occurs in about 80 per cent. of all cases of pregnancy, and is especially common in the primipara. It usually commences about the sixth week and continues until the eighteenth or twentieth, but it may be experienced at intervals until the commencement of the ninth month. It is rarely observed during the first and last months of pregnancy.

In most instances it takes the form of severe retching in the early morning when the patient rises from bed, which results in the expulsion of a little gas from the stomach, but in other instances there is much antecedent nausea and the ejecta consist of thick mucus mixed with saliva and bile. This form of vomiting is therefore very similar to that met with in the various forms of toxic gastritis, and is only distinguished from that of early phthisis by the absence of cough. When vomiting occurs after meals nausea develops as soon as food has been swallowed, and the patient is obliged to leave the table in order to vomit. In other instances the attack is deferred until after the meal, and is then preceded by much nausea, palpitation, and salivation. As far as my experience goes, the vomit consists of undigested food and contains no free acid, but Fox and a few other writers about the middle of last century speak of the existence of "hypersecretion." In all cases the bowels are confined, and the appetite is capricious. Occasionally, the vomiting appears to arise from some violent emotion, or is induced by the smell of fish, game, or lilies, by a hot atmosphere, or by the movement of a vehicle.

(3) *Gastric intolerance*, or *pernicious vomiting*, is a rare but very dangerous gastric disorder of pregnancy. Like the former variety, it may commence at any period after the first month and continue until the seventh or eighth month. As a rule, however, serious exhaustion develops between the third and the fifth months, to which the patient either succumbs or from which she is saved by the induction of abortion. In this variety nausea and retching occur at all times of the day and every attempt to administer nourishment by the mouth at once excites vomiting. This condition of gastric intolerance produces such rapid emaciation and profound weakness that syncope is apt to occur after the least exertion. Attacks of diarrhœa occasionally supervene; the skin becomes dry and harsh, and the urin-

ary secretion is much diminished and often contains albumin and casts. With the progress of the complaint, a sign of impending danger invariably develops, namely, a steady increase in the rapidity of the pulse; the tongue tends to grow foul and dry, delirium and perhaps epileptic convulsions occur, and icterus often makes its appearance before death.

Etiology.—It has always been the custom to ascribe the "vomiting" of pregnancy to nervous or reflex causes. In the former category hysteria is supposed to play the predominant rôle, while in the latter stretching of the uterine nerves, pressure of the enlarged organ upon those of the sacral plexus, congestive inflammation of the os or cervix, inflammation of the deciduæ, or displacement of the uterus are regarded as the most important. When, however, the disorder is considered in the light of our present knowledge of diseases of the digestive organs, there are several facts which militate greatly against the theories of nervous origin. In the first place, there is no reason to regard the gastric intolerance of pregnancy as a clinical entity, since its symptoms are exactly similar to those met with in toxic inflammations of the stomach. Moreover, characteristic lesions are met with in the liver, which consist of hæmorrhage and necrosis affecting in the first instance the centres of the hepatic lobules. Similar changes occur at the periphery of the lobules in fatal cases of eclampsia; but although the latter complaint is closely allied in origin to the gastritis it never develops at such an early stage of pregnancy nor before the formation of the placenta. Secondly, the jaundice and fever which sometimes accompany the complaint, although common in cases of toxic gastritis, are never met with in disorders of digestion of nervous origin. Thirdly, vomiting in the early morning is a very characteristic symptom, and when it appears independently of cough, invariably indicates the existence of chronic gastritis.

Fourthly, no theory of reflex irritation will explain the dyspepsia which occurs in pregnant women who do not vomit, the features of which, however, are identical with those that ensue from certain toxic inflammations of the stomach and intestine. Finally, although the stomach may present to the naked eye no indications of inflammation after death, I have never known a case of fatal vomiting in pregnancy in which the microscope failed to demonstrate severe parenchymatous gastritis, and a similar statement was made by Wilson Fox about the middle of last century.

These facts appear to negative the hypothesis of simple nervous or reflex irritation, and to indicate that in all probability the digestive disturbances of pregnancy are dependent upon absorption from the placental chorion of some toxic substance which is excreted by the stomach and bowel after the manner of urea and other products of metabolism. Idiosyncrasy plays such an important part in the influence of poisons upon the organs of the body, that, granted a condition of toxic absorption from the uterus, it might reasonably be concluded that the same dose would affect some women more than others; while the accidental existence of an abnormally high intrauterine pressure would of necessity promote a more rapid absorption of the poison. This theory of increased pressure would account for the relief of the gastric symptoms which sometimes ensues from digital dilatation of the cervix, as well as for the rapid disappearance of the vomiting which commonly occurs after rupture of the membranes, even though delivery is postponed for several days.

Treatment.—In all cases the patient must take regular daily exercise in the open air and rest for at least half an hour after the principal meals. As a rule, in the absence of vomiting or when this symptom is mild in character an ordinary mixed diet is allowed. The bowels must be

maintained in regular action by means of a simple aperient, such as cascara, syrup of figs, the compound rhubarb pill, or one of the preparations of paraffin, while a dose of calomel, grey powder, or mercurial pill once or twice a week is valuable if the appetite fails. If the dyspepsia is dependent upon some pre-existent disease of the stomach, such as hypersecretion, ulcer, or gastritis, the diet appropriate to these conditions must be enforced. In neurotic women a course of bromides, with bismuth, magnesia, and peppermint or capsicum usually proves beneficial; but since the disturbance of digestion always depends upon slight parenchymatous gastritis, the exhibition of dilute hydrochloric acid after meals relieves the flatulence as readily as it does the milder forms of vomiting. In most cases, twelve to fifteen minims of the acid should be combined with a teaspoonful of glycerin, three minims of tincture of capsicum, and half an ounce of the compound infusion of gentian; but occasionally the addition of twelve minims of the glycerin of carbolic acid proves useful as an antiseptic. If excessive flatulence develops during the night, half a drachm of the essence of Ricqlès in a little water is a most valuable remedy.

When vomiting occurs in the early morning the patient should take her breakfast in bed and carefully avoid exercise immediately after meals. Some authorities advise an excess of carbohydrates in the diet on the assumption that the maternal hepatic glycogen is deficient, and if vomiting is excessive the administration of large quantities of water to correct dehydration. The latter is quite useful if the patient vomits the fluid and thus washes out her stomach; but if the water is retained the sense of distention or flatulence is usually increased. Raw vegetables and fruits never agree, and stimulants should only be given in small quantity with the food. Sugar, even in the form of sweets, sometimes appears to relieve the dyspeptic

symptoms and even to stimulate appetite. Vomiting in the early morning is an effort on the part of the stomach to rid itself of the sticky mucus, saliva, and bile which have accumulated during the night, and should therefore be encouraged, unless severe. In the latter case, a dose of neutral phosphate of sodium or of Rochelle salt in a tumblerful of hot water soon after waking almost always affords relief. For sickness after meals many drugs have been recommended with doubtful success, of which the most important are tincture of iodine in drop doses every hour, cocain and bismuth, morphine, and oxalate of cerium. As a matter of fact, the hydrochloric acid and gentian mixture previously mentioned, when given immediately after meals, and combined with an occasional dose of a mercurial at night and a saline in the early morning, seldom fails to relieve the emesis. In more serious cases, the dietary must be composed of peptonized milk, whey, or koumiss, and even rectal feeding with fifteen ounces of peptonized milk slowly run into the bowel through a catheter every six hours may become necessary.

Lavage with a warm alkaline water is one of the most effective methods of controlling the excessive emesis, the stomach being well washed out two or three times a day. After a few days 6 ozs. of warm peptonized milk will often be retained if introduced into the viscus under pressure through a tube (gavage). Since general exhaustion always tends to maintain the emesis, much good may be done by large saline transfusions into the cellular tissue of the pectoral region. Among the numerous drugs that have been recommended for the treatment of pernicious vomiting the hypodermic administration of morphine and atropine, full doses of chloretone by the mouth, or of bromides by the bowel are probably the most valuable. Rapid emaciation accompanied by a dry tongue, rapid pulse, and delirium are indications for the induction of abortion.

(12) DYSPEPSIA DUE TO DRUGS

Comparatively little is known respecting the toxic influence of drugs upon the digestive organs. Chronic poisoning by phosphorus, arsenic, antimony, and alcohol is usually accompanied by chronic inflammation of the stomach and intestines, with fatty degeneration of the cells of the gastric glands and of Lieberkühn's follicles, and by organic changes in the liver and kidneys. Digitalis, trinitrine, and the salicylates and iodides are also apt to excite gastritis, while in some persons even small doses of iron, quinine, and nux vomica invariably produce a similar disorder. It is probable that many metallic salts are absorbed by the intestine and subsequently excreted by the peptic glands which fall victims to their own abnormal activity. Thus, in frogs and guinea-pigs, I found that the injection of sulphate of iron beneath the skin was soon followed by the appearance of the salt in the contents of the stomach, while repeated injections gave rise to acute gastritis, the microscopical signs of which were accompanied by the presence of iron in the peptic cells. When a tendency to hyperchlorhydria exists all tonic remedies excite an excessive secretion of hydrochloric acid, while aspirin and salicylate of sodium act as veritable poisons. Hitzig's experiments with morphine show that when the drug is injected subcutaneously, a considerable proportion of the salt is excreted by the stomach and gives rise to a marked diminution of the gastric secretion. In morphinism the production of hydrochloric acid is practically suspended, but if the patient is successfully treated this secretion becomes gradually re-established. The effects of " preservatives " in foods have already been discussed (p. 159).

CHAPTER X

INTESTINAL INDIGESTION

The problem of indigestion in the intestines is an exceedingly complex one. In the case of the stomach, the development of discomfort within two hours of a meal, combined with nausea, vomiting, or gaseous eructation, always indicates that organ as the seat of the disorder, while the adoption of clinical methods which permit an accurate estimation to be made of the secretory and motorial powers of the viscus helps to establish an accurate diagnosis. The intestine, however, differs from the stomach in several important particulars. The canal itself is relatively inaccessible, and although duodenal intubation may in the future become an established factor in diagnosis, its performance can never be so easy nor its results so unequivocal as exploration of the stomach. An examination of the excreta, again, is a difficult and laborious procedure, which a busy practitioner has neither the special knowledge nor the time to pursue, while the results obtained from it, although affording valuable information concerning the digestion and absorption of the various food-stuffs, are liable to be perverted by so many accidental factors, that it is doubtful whether it will ever serve to demonstrate with certainty the disease from which the aberration of function arises. The intestinal canal is also the recipient of at least three secretions, each of which combines several separate functions whose energy may be temporarily increased or diminished through the influence of local conditions, the

existence of which can neither be foretold nor even recognized with certainty.

Again, the numerous bacteria that inhabit the alimentary tract possess important putrefactive properties, the activity of which is vastly increased in all disorders of the digestive and excretory organs of the body. Finally, there is always a close resemblance between the general symptoms of gastric and intestinal indigestion, and when a painful contraction of the colon ensues immediately after the ingestion of food, much difficulty may exist in assigning the pain to its proper cause, especially if the stomach happens to lie abnormally low in the abdominal cavity. For these several reasons it is advisable to consider, in the first place, the general effects of a disturbance of the intestinal functions and subsequently the nature and symptoms of such morbid conditions as may be regarded as clinical entities.

Normal and Abnormal Digestion.—The first portion of the intestinal canal, or duodenum, is probably one of the most important regions of the whole tract. Although only about ten inches in length, it receives the entire secretions of the liver and pancreas, besides producing by means of its own glands a distinct and important juice. In shape it is very like a horseshoe, and this curious contour is permanently preserved by its fixation to the spine and contiguous tissues. Viewed from the front, with the stomach and jejunum attached, it exhibits a great similarity to the trap of a water-closet, and, from the fact that it usually contains fluid, there can be no doubt that one of its functions is to prevent regurgitation of gas and chyme from the lower regions of the bowel. Its location is, however, one of considerable danger, since it encircles the head of the pancreas, which is liable to chronic if not to temporary enlargements, while its third portion is sandwiched between the abdominal aorta and the superior mesenteric artery, both of which are prone to extreme degrees of atheroma as well as to

aneurismal dilatation. The duodenum is also the first part of the intestine to feel the effects of disordered gastric digestion and to be exposed to any irritant poison introduced through the mouth or eliminated by the bile; while its special glands act vicariously as kidneys in the excretion of organic poisons from the circulation. It is small wonder, therefore, that the duodenum is more liable to inflammation than any other portion of the intestine and that this complaint is attended by a disturbance not only of its own secretion, but also of the functions of the other important organs of digestion. It has already been noticed that the duodenum usually contains a certain amount of fluid in its dependent loop. This is due to the automatic preparations that are constantly in evidence in this portion of the bowel for dealing immediately with the chyme transmitted from the stomach, both in the interests of digestion and also as a safeguard against injury by any sudden increase of the gastric acidity. In the intervals of digestion, such as normally occur during the early hours of the morning, the secretions of the liver and pancreas remain within the ducts of their respective glands; but as soon as food enters the stomach these juices are poured into the bowel, where they become mixed with the succus entericus. The amount of this "preparatory" secretion, as well as its degree of alkalinity, are directly proportionate to the nature of the meal and the acidity of the gastric juice; and although it usually ceases as soon as the last remnants of chyme have passed into the jejunum, it is probably continuous in cases of gastric hypersecretion and in those where pyloric spasm causes prolonged retention of food in the stomach. While awaiting the advent of chyme the duodenum is motionless; but as soon as the gastric contents commence to pass through the pylorus an energetic peristalsis is set up, which effects a rapid incorporation of the chyme with the preparatory secretion and hurries the mixture into the lower regions

of the bowel, where the ultimate processes of digestion and absorption take place. The first portions of the gastric chyme rarely contain free hydrochloric acid, and consequently the material in the duodenum remains alkaline for some time; but with each fresh consignment neutralization becomes less complete until eventually the duodenal contents remain permanently acid. A slight degree of free acidity does not interfere with intestinal digestion while it probably stimulates both the secretion of the pancreas and the peristalsis of the upper bowel, with the result that the alkalinity of the former becomes progressively augmented and the chyme is expelled with greater celerity into the jejunum. It is only when a permanent excess of free hydrochloric acid occurs in the duodenum that the processes of intestinal digestion become seriously disturbed. If it were not for the provision of the "preparatory secretion," which always awaits the advent of the chyme, not only would digestion in the intestines be suspended until sufficient secretion had been poured out to deal with the various foodstuffs, but the organism would be exposed during the interval to all the dangers that ensue from the continued existence of free hydrochloric acid in the upper bowel. The time occupied by the transit of chyme through the duodenum is too brief to permit of much digestion or absorption in this portion of intestine, and the term "duodenal digestion" must, therefore, be regarded as a misnomer. In like manner "duodenal indigestion" cannot be considered as a clinical entity, since the phenomena that are attributed to it are really produced in the jejunum and ileum and are dependent either upon an abnormal condition of the pancreatic or biliary secretions or upon disease of the intestinal mucous membrane.

The part played by the *bile* in the chemical elaboration of the food is a subject that has been much debated, but there is little doubt that were it not of considerable impor-

tance in the scheme of digestion it would not be poured into the intestine so close to the stomach along with the potent secretion of the pancreas, nor would it vary so markedly in quantity with different kinds of food. Among other properties, bile promotes a partial emulsification of fats and also aids the fat-splitting ferment of the pancreas, it having been shown by von Nencki that a mixture of bile and pancreatic juice splits up nearly three times as much fat as can be effected by the latter fluid alone. By its alkalinity bile increases the formation of soaps, and it also facilitates their absorption by the intestinal mucous membrane. It also stimulates the peristaltic movements of the bowel. The fatty stools, constipation, and the excessive intestinal putrefaction which accompany chronic jaundice amply confirm the existence of these physiological functions of the hepatic secretion. Several by-products of digestion as well as many substances that accidentally gain access to the body are eliminated by the liver and are thereby rendered innocuous to the system, although in some instances the mere contact of this toxic bile with the surface of the duodenum appears to excite severe inflammation of its mucous membrane. Bile is never absorbed into the circulation through the blood capillaries, but invariably finds its way into the lymphatics of the liver and thence into the blood through the thoracic duct. The patency of the latter is consequently essential to the production of jaundice in cases of obstruction of the common bile-duct.

The *pancreatic juice* is also a continuous secretion which is much augmented during the period of intestinal digestion. It is thick, transparent, and colourless, and is strongly alkaline in reaction owing to the presence of carbonate of sodium. It contains four special ferments, each of which exercises an important influence upon digestion. The diastatic ferment, or amylopsin, is very similar in its action to ptyalin, and at the temperature of the body

rapidly converts starch into maltose, and achroödextrin into sugar. The proteolytic ferment, trypsin, is most active in an alkaline medium, although it is not entirely inhibited by a slight degree of acidity, and changes the proteids that have escaped solution in the stomach into peptones. Some of the intermediate products of digestion undergo bacterial putrefaction, with the ultimate production of indol, skatol, volatile fatty acids, and various gases.

The action of the pancreatic juice upon neutral fats is twofold: it produces a fine permanent emulsion and also splits a portion into glycerin and the corresponding fatty acids, the latter result being due to the fat-splitting ferment, steapsin. The fatty acids thus liberated are partially saponified by the alkalies of the pancreatic and intestinal fluids and partially emulsionized. The milk-curdling ferment is probably most active in early life.

The *succus entericus*, the functions of which have long been a puzzle to physiologists, has recently been investigated anew with much success by Pawlow and his assistants. It would appear that this secretion is only poured out in an active state in the presence of chyme, and that its special ferment, to which the name enterokinase has been given, is to a great extent dependent upon the presence of pancreatic juice in the bowel. It has already been noticed that bile is the great adjuvant of the fat-splitting ferment of the pancreas, and it is now known that enterokinase acts as an accentuator of the various ferments of the same gland, but more especially of trypsin. It has also been found that while the secretion produced by the mucous membrane of the whole of the small intestine augments the digestive powers of the entire pancreatic secretion, that of the duodenum exerts the greatest influence upon proteolysis, the activity of which it increases to a remarkable degree. These facts possess a certain amount of clinical interest in connexion with the effects of chronic duodenal inflammation

and atrophy upon the digestion of the albuminous constituents of the food.

The alimentary canal, and more particularly the large bowel, teems with micro-organisms the numbers and species of which are liable to vary under different conditions. It was formerly supposed that the presence of bacteria was essential to intestinal digestion, and the results of certain researches were supposed to prove that a sterile bowel is incompatible with perfect health. The more recent experiments of Metchnikoff appear, however, to controvert this view and to suggest that the digestion of cellulose, instead of being effected by bacterial activity, is probably the outcome of a special, though at present unidentified, ferment. It is also possible that in addition to the various recognized infections of the intestine, the accidental introduction of certain benign species may stimulate the activity of the natural inhabitants to such a degree as to produce severe inflammation or even ulceration of the alimentary tract.

The absorption of the products of digestion is chiefly carried out by the bowel. Water, peptones, and the soluble salts necessary to nutrition rapidly find their way into the blood and lymph vessels of the alimentary canal, while sugars are absorbed more slowly by the rootlets of the portal vein. It is probable that emulsified fats and unchanged proteids, in addition to water, are capable of being absorbed by the large intestine. The exact manner in which fats pass into the lacteals has not yet been definitely settled, but it is certain that a small proportion is absorbed in the form of soluble soaps or as an emulsion. The greater part of the neutral fats passes through the columnar epithelium as emulsified fatty acids and glycerin, which in the wall of the bowel are again synthetized into neutral fats, while the soluble soaps which are dissolved in the glycerin are reconstituted in a similar manner.

Intestinal digestion is so complex in its character and

depends upon the physiological integrity of so many different tissues, that were it not for the wonderful automatic mechanism which regulates the various functions of the bowel and of the glands that pour their secretions into it, digestion and absorption would soon be reduced to a state of chaos. This fact is readily comprehended when the effects of disordered gastric digestion upon the functions of the intestine are considered. An excessive degree of gastric acidity accompanies many disorders of the stomach, but instead of immediately disturbing the processes of digestion in the bowel, the automatic adjustment is brought into force and perfect compensation results. Thus, the preparatory secretion is at once increased both in quantity and alkalinity for the purposes of neutralization, while the augmented acidity of the duodenal chyme acts as a powerful stimulant to pancreatic secretion and intestinal peristalsis. Even the pyloric spasm that accompanies gastric hyperacidity is not entirely inimical, since by prolonging the period of gastric digestion it ensures a more complete solution of proteids in the stomach and affords time for a greater accumulation of alkaline juices in the duodenum. In cases of diminished gastric acidity, peptic digestion is seriously interfered with, but a much larger proportion of starch is converted into sugar, and the work of the intestine in this respect is lessened. Although this condition is attended by a corresponding diminution in the amount of bile and pancreatic juice, compensation remains complete owing to the fact that less alkali is required for neutralization and consequently a greater proportion remains available for the digestion of proteids and fats. The intestinal secretions also vary both in quantity and quality with the composition of each meal: an excess of starch or proteids being productive of increased amylolytic or tryptic activity, while a diet composed largely of fat chiefly stimulates the secretion of bile and steapsin. These automatic adjustments may continue to work with

perfect precision for a considerable time, but sooner or later the functions of the small intestine and other digestive glands become exhausted and the processes of compensation begin to exhibit signs of failure. Under these circumstances fat is usually the first constituent of the food to suffer, and its diminished absorption is evidenced by an increased evacuation of neutral fats and combined fatty acids. Subsequently the proteids undergo excessive putrefaction and finally the carbohydrates are decomposed by bacterial action and the production of sugar is diminished. This failure of compensation naturally occurs at an earlier date when the gastric disorder arises from organic disease. Thus, when subacidity ensues from chronic gastritis the intestine becomes hampered not only by the products of abnormal fermentation, but also by the presence of bacteria, and consequently intestinal inflammation, accompanied, perhaps, by an infection of the biliary or pancreatic ducts, almost invariably develops and seriously interferes with the digestive functions. In like manner, a continuous and excessive hyperacidity of the gastric juice tends to exhaust the activity of the pancreas and to excite a form of chronic intestinal inflammation which eventually retards the solution and absorption of food.

In addition to the disturbing influences of disordered gastric digestion, the functions of the small intestine are always liable to become deranged by any abnormal condition of the colon or other excretory organ of the body. Thus, an exalted neuro-muscular irritability of the large intestine, by increasing the rapidity with which its contents are eliminated, tends to hurry the chyme through the upper bowel and thus to curtail the time necessary for its absorption; while an inefficient peristalsis not only retards the transmission of chyme through the alimentary canal, but also favours its putrefaction and the absorption of the chemical poisons which ensue from it.

The whole of the intestinal tract is also called upon to aid in the elimination of urea and other excrementitious products whenever the renal functions are seriously interfered with, and is injuriously affected by the venous congestion that arises from diseases of the heart or lungs or from obstructions of the portal circulation; while in itself it is prone to various forms of inflammation, ulceration, and displacement, all of which materially hamper its physiological activity. Finally, the processes of intestinal digestion are at all times dependent upon the integrity of the liver and pancreas, since any disease of these glands interferes at once with the chemical elaboration of the food. Many of these morbid conditions cannot be detected by the clinical methods at present in vogue, and in the limited state of our knowledge it is necessary to concentrate our attention upon such disorders as permit of clear definition and easy recognition. I, therefore, purpose to consider in the first place intestinal indigestion in its entirety, and subsequently the three principal subdivisions of the complaint, the symptoms of which arise either from a deficient supply of bile or pancreatic juice or from a spasmodic contraction of the musculature of the bowel. To the first of these the term chronic intestinal indigestion may be applied, while the others may be described, respectively, as duodenitis, pancreatitis, and enterospasm. The principal features of intestinal neurasthenia have already been noticed under the gastric disorder of that name, while the clinical phenomena of enteroptosis are practically identical with those which accompany splanchnoptosis.

(1) CHRONIC INTESTINAL INDIGESTION

Etiology.—The causation of indigestion in the intestinal canal may be discussed upon the same lines as those laid down in the case of gastric dyspepsia. It must always be remembered, however, that the failure of one function in-

variably leads to the disorder of another, and that whatever may be the nature of the primary perversion, all the other functions of the bowel will eventually become deranged.

Disorders of secretion concern not only the glands of the intestinal mucous membrane, but also the liver and pancreas. In the former case, a deficiency of succus entericus is probably accompanied by diminished tryptic activity and enfeeblement of the powers of absorption, while a decrease in the amount of bile lessens the digestion of fats, and failure of the pancreatic juice puts a stop to all the more important processes of digestion.

Inflammations of the intestine arise from many different causes and either continue simple in character or proceed to ulceration or atrophy of the mucous membrane. In the latter case, the food not only undergoes excessive decomposition, but is hurried through the canal before the alimentary substances which might still prove of value to the organism are capable of being absorbed. The febrile condition which accompanies many forms of enteritis also exerts a pernicious influence upon the glandular structures of the stomach and pancreas, so that eventually the secretions of these important viscera become valueless for the purposes of digestion.

Weakness of the muscular coat of the bowel (*myasthenia*) induces excessive putrefaction of the contents of the alimentary canal, the gaseous products of which distend and stretch the already enfeebled tissues and further increase the disorder. Many of the poisons that are formed by the decomposition of food are absorbed into the circulation and are subsequently eliminated by the bile, whose functions become impaired in the process. The frequent coexistence of gastric myasthenia also throws an additional strain upon the pancreatic secretion, which is apt to suffer still further from the development of secondary inflammation of the duodenum.

The various *nervous disorders* of the alimentary tract derange the peristaltic movements of the bowel, induce gaseous distention of its coils, diminish its powers of absorption or impair the secretory activity of its glands; while the severe pain with which they are sometimes accompanied destroys appetite, interferes with sleep, and induces a state of general ill-health which is prejudicial to digestion.

Foreign bodies are seldom met with in the intestine, but the numerous worms and other parasites which occasionally inhabit the bowel sometimes give rise to pain and other symptoms of indigestion or even excite chronic inflammation. Intestinal indigestion invariably ensues when *other important viscera* are affected by disease. Thus, organic mischief of the heart, lungs, liver, and spleen is always accompanied by impairment of secretion and absorption, and chronic inflammation of the kidneys gives rise to a form of enteritis that is often associated with ulceration. Anæmia and other abnormal states of the blood are usually attended by atony of the colon, while syphilis and many specific fevers develop gastroenteritis during their febrile manifestations.

Symptoms.— The clinical picture of chronic intestinal indigestion is very difficult to delineate on account of the mixed lesions that are concerned and the numerous symptoms of secondary origin. In the great majority of cases deterioration of the general health and malnutrition constitute the most important evidences of ill-health, and it is only after careful inquiry that the true nature of the complaint becomes manifest.

The disorder affects both sexes and occurs at all ages, but it originates, perhaps, most frequently within the first two decades or after middle life. In the former case, inflammation of the bowel is the usual cause of indigestion, but in the latter, disease of the pancreas, liver, or other important organ of the body is primarily responsible for it.

Diminution of energy, failure of interest, debility, in-

somnia, and a gradual loss of flesh constitute the main causes of complaint, while the patient's relatives almost invariably comment upon his irritability of temper, moodiness, capricious appetite, disinclination for exertion, or a tendency to hypochondriasis. Vague pains in the back, neck, shoulders, and head so often exist that they cannot be regarded as purely accidental, and should receive more attention than is usually accorded to them. In long-standing cases the skin often exhibits a sallow, unhealthy appearance and the surface of the body exhales an unpleasant odour and is apt to become bathed in sweat from slight exertion, annoyance, excitement, or even after the ingestion of a cup of tea or other hot fluid. When the functions of the pancreas are seriously at fault, the complexion presents the characteristic clay-coloured tint, which deepens to yellow from time to time. The hands and feet are cold and clammy, the pulse is full, slow, and feeble, and reference is frequently made to a deficient elimination of urine or to the cloudiness and strong odour of the fluid.

Sleep is either broken and unrefreshing, or is replaced by a form of stupor in which the brain appears to remain abnormally active. Many individuals suffer from headache or drowsiness after every meal, and only shake off their apathy toward evening or when it is time to retire to rest.

The special symptoms of the disorder are usually as vague as those of the general ill-health. As a rule, however, there is a constant sense of weight or uneasiness in the left iliac fossa which sometimes is described as actual pain. Discomfort in the early morning sufficiently noticeable to wake the patient or to prevent further sleep is a common and very suggestive symptom, and is not infrequently attended by a desire to pass water or to evacuate the bowels. A call to stool may result only in the noisy expulsion of a large quantity of foul-smelling flatus, but in many instances the passage of a pultaceous motion is followed by immediate

relief. During the process of dressing, the whole abdomen feels inflated and tender, and difficulty may be experienced in adjusting the corsets, owing to temporary enlargement of the waist. This condition is usually accompanied by a foul taste in the mouth, headache, nausea, giddiness, and the eructation or passage of gas. Breakfast may serve to relieve these various symptoms, but as a rule abdominal discomfort and distention recur within one or two hours, attended, perhaps, by colicky pains in the region of the umbilicus or descending colon. Other patients suffer much annoyance from loud rumblings in the belly at different times of the day and the constant passage of flatus. Mental worry, fatigue, excitement, or exposure to cold almost invariably causes an acute exacerbation of all these abdominal symptoms and sometimes gives rise to extreme nausea. The state of the bowels varies according to the chronicity and the exact nature of the disorder. As a rule, constipation exists during its earlier stages, and much relief is afforded by the use of aperients; but with the progress of the complaint the stools tend to become loose and eventually diarrhœa is a prominent feature of the case. This latter condition is most often encountered if the digestion of fat is at fault, when the motions are soft or pultaceous, pale in colour, and have a peculiar acid smell. Excessive carbohydrate fermentation is usually accompanied by spasmodic griping and the passage of sour and offensive stools, while interference with proteid digestion gives rise to much flatus and the dejecta smell as if affected by decay. The state of the gastric digestion varies considerably in different cases, pancreatic and biliary disorders being usually attended by hyperacidity, and inflammation of the intestines by gastritis. Fæces coated with slime usually indicate chronic constipation, and the presence of balls or strings of mucus in the stools is a common feature of colitis. Gelatinous, bile-stained motions voided immediately after meals

often serve to locate the functional disorders in the jejunum, while the mucus derived from the cæcum and ascending colon is intimately mixed with fæcal material, but is free from bile. The chemical reaction of the stools varies according to the nature of the complaint: deficient proteid digestion is accompanied by alkaline stools and interference with the absorption of fats and excessive fermentation of carbohydrates by an acid reaction of the dejecta. The appetite is almost always impaired, and there is sometimes a marked distaste for those constituents of the food whose digestion is disturbed. This is particularly the case in diseases of the liver and pancreas, the subjects of which may express the greatest repugnance to fats, oils, and eggs, and suffer from severe nausea, flatulence or acidity after partaking of them. Thirst is sometimes such a conspicuous feature as to suggest glycosuria. As a rule, the tongue is coated with a white or brownish fur, which partially clears away during the course of the day; the breath is offensive, and in many cases a chronic nasopharyngitis exists, which is very difficult to cure so long as the intestinal disorder continues. The urine is diminished in quantity and deposits an excess of phosphates on standing. In many cases of mixed intestinal indigestion I have observed constant slight albuminuria, which diminishes or disappears when the condition of the bowel improves and is usually accompanied by an unusual degree of general debility and anæmia. No casts or other indications of renal inflammation exist. Sugar or the pancreatic reaction may be detected in some cases. Long-continued intestinal indigestion is always attended by steady loss of flesh, and in most instances by a progressive anæmia which is characterized by a diminution both of red corpuscles and hæmoglobin. In cases of gastrointestinal atrophy, secondary to chronic inflammation, the state of the blood closely resembles that of pernicious anæmia. Irritation of the skin often accompanies deficient digestion

of fats, and is especially troublesome when sallowness of the complexion suggests slight obstruction of the common bile-duct. In other cases attacks of urticaria coincide with every exacerbation of the digestive disorder, or patches of dry eczema affect different parts of the body. Loss of hair and premature baldness are a noticeable feature in some instances. Among the minor and less constant symptoms, periodic headaches, like those of migraine, attacks of giddiness or faintness, palpitation, noises in the head, persistent nausea, numbness of the fingers, and loss of memory are especially noteworthy.

Physical Signs.—The abdomen is usually slightly distended, soft, doughy, and easy to manipulate, but should the intestines happen to be unduly inflated it may exhibit the tense and tympanitic condition which is so suggestive of obstruction. In such cases, however, much flatus is passed and the bowels act under the influence of suitable aperients. Tenderness on palpation rarely exists in the absence of secondary inflammation or ulceration. When the colon is chiefly affected, its transverse portion may be visible on inspection, or an ill-defined swelling may be observed in the region of the cæcum or sigmoid flexure. These indications of local distention are not accompanied by pain nor do they exhibit the peristaltic movements which characterize a hypertrophied coil of gut in front of a stricture, and they either subside spontaneously with a slight noise or disappear after manipulation or friction of the skin. Most sufferers from chronic indigestion in the bowels complain of loud rumblings or gurglings, which are particularly troublesome after meals or are excited by physical exertion, respiratory efforts, or a mental emotion, and in almost every instance minor splashings, bubblings, or sizzling sounds are audible when a stethoscope is placed upon the abdomen. If emphysema exists, the edge of the liver may project several inches below the costal margin,

and a moderate downward dislocation of the stomach, intestines, and right kidney may be detected. The anus is often patulous and the rectum more capacious than normal and its mucous surface unusually smooth, while not infrequently piles or fissure have existed for a considerable time.

The progress of digestion in the alimentary canal may be investigated by duodenal intubation, by Einhorn's bead-test, and by chemical analysis of the excreta.

Intubation of the duodenum, as practised by Hemmeter, consists of the introduction into the stomach of a distensible bag along the upper margin of which runs a small tube that can be pushed through the pylorus. This method has not been extensively used up to the present and it is very doubtful whether an examination of the contents of the duodenum will throw much light upon the chemical elaboration of the food in the upper bowel.

Einhorn has invented an ingenious method of testing the activity of the different ferments of the pancreas. It consists of a gelatin capsule containing several beads that are strung together on a silk thread and to each of which one or two pieces of the substances to be examined are attached. These test-materials consist of catgut, fishbone, meat, potato, fat, and thymus, the first two of which are normally dissolved in the stomach and the rest in the intestines. The string of beads usually appears in the stools within forty-eight hours after the capsule has been swallowed. If they are evacuated within twenty-four hours the motility of the bowel is increased, while a delay beyond two days indicates diminished motility. Inspection of the test-substances shows whether they have been digested or not, whereby the activity of the different processes of digestion may be inferred.

An X-ray bismuth meal is now invariably employed to demonstrate the motility of the intestine.

Undoubtedly the most accurate method of investigating intestinal digestion is that of fæcal analysis. It is, however, a tedious process and one that requires considerable experience and the expenditure of much care. For the purposes of comparison with the normal, it is necessary to give the patient a special diet the composition of which is known, and to examine the total amount of the excreta which result from it. It is also advisable to administer a dose of charcoal both before and after the experiment, and to collect for analysis all the fæces which are passed between the two appearances of charcoal in the stools.

Various forms of diet are employed, but that recommended by Schmidt is the most convenient, and is as follows:

7.30 a.m.—Milk, 17½ ozs. and 6 rusks.

9 a.m.—Gruel made from 1½ oz. of oatmeal, ½ oz. of butter, 7 ozs. of milk, 10½ ozs. of water, 1 egg, and 2 biscuits.

1 p.m.—4½ ozs. of minced beef (weighed raw), lightly fried in ½ oz. of butter, and potato purée made from 4 ozs. of mashed potatoes, 7 ozs. of milk, and ½ oz. of butter.

4 p.m.—17½ ozs. of milk.

7.30 p.m.—Same as at 9 a.m.

This diet contains 102 grm. of proteid, 11 grm. of fat, and 191 grm. of carbohydrates, equivalent to 2297·37 calories. The average daily weight of fæces which result from it amounts to 89·8 grm., which contain about 76 per cent. of water.

Chemical Analysis of the Fæces.—1. The *Estimation of Nitrogen* (*Kjeldahl's Method*).—A weighed quantity of the mixed fæces is placed in a capsule and a decinormal solution of sulphuric acid is poured over it in the proportion of 20 c.c. to each 100 grm. of moist fæces in order to prevent any loss of ammonia in the process of drying. The capsule is then placed over a water-bath and, with frequent stirring, is allowed to dry until the fæces are fairly hard. The capsule

is then removed, placed in a hot-air oven at 60° F. for two hours, and cooled over sulphuric acid in a desiccator. The contents, when cool, are transferred to a mortar and ground into a fine powder. One gram of this powder is then placed in a Kjeldahl's destruction flask with 25 c.c. of strong sulphuric acid and 1 grm. of sodium pyrophosphate. The flask is allowed to stand for a few hours and is then heated over a Bunsen burner. The heat must at first be gentle. The contents of the flask, having been heated until they are quite colourless, are allowed to cool. By this process all the nitrogen present in the fæces is converted into ammonium sulphate and the organic matter destroyed by oxidation.

The cold contents of the flask are carefully washed with about 600 c.c. of water, a few granules of zinc are added, and a strong solution of sodium hydrate is mixed with the material until the reaction becomes alkaline. The flask is then connected with a distillation apparatus and distillation carried on until all the ammonia present in the flask has passed into a receiver containing a measured quantity of decinormal solution of sulphuric acid, with which it forms sulphate of ammonium. The acid solution is then triturated with the decinormal solution of sodium until neutralization has been effected, and the amount of the alkaline solution used for this purpose having been subtracted from the original amount, the remainder will give the quantity of sulphuric acid which has been neutralized by the ammonia distilled over, from which the total nitrogen present in the fæces can easily be computed.

The nitrogen of the fæces is not entirely derived from the food, but also arises in part from the epithelium of the mucous membrane, the elements of the various secretions, mucus, and bacteria. After Schmidt's diet, Harley and Goodbody found the quantity of nitrogen eliminated in the fæces averaged 0·88 grm. per diem. It is very doubtful

whether the estimation of nitrogen has any practical bearing upon diagnosis.

2. *The Estimation of Fats* (*Cammidge*).—Two clean, dry, Schmidt-Stokes milk-tubes, labelled A and B and provided with a 10 c.c.-mark, are taken, and into the lower bulb of each is introduced an accurately weighed quantity (about half a gram) of finely powdered fæces that have been dried to a constant weight on a water-bath. The residue on the watch-glass used for weighing, and on the sides of the short-necked funnel with which the powder is introduced into the tube, is washed down with a fine jet from a wash-bottle, which for the A tube contains hydrochloric acid (1 in 3) and for the B tube plain water. The sides of the tube are also washed until the whole of the sample is collected in the lower bulb, and the 10 c.c.-mark is reached. The A tube is then heated in boiling water for twenty minutes, occasionally rotating it so as to well mix the contents. After cooling, both tubes are filled to the 50 c.c.-mark with ether, securely corked and inverted forty times, taking care that the whole of the solid material runs through at each turn. Each tube is then rotated between the hands and allowed to stand for half an hour or more, in order that the solid residue may be collected in the lower bulb. Considerable care is necessary in carrying out this part of the process in some instances, or a perfectly clear supernatant layer of ether, free from solid particles, is not secured. With a pipette, exactly 20 c.c. of the clear ethereal extract are drawn off from each tube and delivered into two CO_2 flasks of known weight, the amount of ether left in the tubes being noted. The ether in the flasks is then evaporated, the residue dried on the water-bath, and the flasks again weighed. From the amount of extract yielded by the 20 c.c. of ether, and the quantity of ether left in the tubes, the total amount yielded by the weight of dried fæces used may be calculated, and from this the percentage in the stool determined.

The result from the A tube gives the total fat in the fæces, including the neutral fats, free fatty acids, and combined fatty acids or soaps, since the latter will have been decomposed by being boiled with the hydrochloric acid and thus rendered soluble; that from the B tube represents the neutral fats and fatty acids only, as the soaps will remain undissolved by the ether; the difference between the two will, therefore, give the proportion of saponified fat present.

The solid residue from the B tube can be used for the detection of stercobilin. For this purpose it is filtered off, extracted with acid alcohol, the extract neutralized with ammonia and mixed with an equal quantity of 10 per cent. zinc acetate in alcohol. The precipitate that forms is removed by filtration, and the clear filtrate examined with a lens, against a black background, for the green fluorescence that indicates the presence of stercobilin. The intensity of the colour varies with the amount of pigment, so that by always using approximately the same proportion of fæces and of the reagents any marked variation from the normal can be detected.

3. *Estimation of the Carbohydrates.*—For all clinical purposes Schmidt's method of estimating the degree of fermentation in the intestines is sufficient. About 5 grm. of fæces are placed in a fermentation tube and well mixed with water. A small tube passes through the rubber stopper and connects the receptacle with two upright tubes which are connected by a transverse pipe, the exterior one of which has a small hole in the top, while that which communicates directly with the fermentation tube is filled with water. The apparatus is placed in an incubator at a temperature of 99° F. for twenty-four hours. Under normal circumstances the gas generated by fermentation never fills more than half of the proximal tube; but if carbohydrate digestion in the bowel is imperfect, a much larger quantity

is produced, the measure of which affords a rough indication of the degree of amylaceous indigestion.

Microscopical examination of the dejecta permits the recognition of an excess of undigested muscle-fibre, fat globules, connective tissue, flakes or needles of fatty acids, starch granules, and crystals of ammonium magnesium phosphate, triple phosphates, calcium oxalate and cholesterin and also those known as the Charcot-Leyden crystals. The presence of epithelial cells and leucocytes may prove of value in diagnosis.

Treatment.—Warm clothing is essential, and a flannel binder should always be worn round the abdomen. A dry, bracing climate suits the majority of cases best. If the disorder is secondary to gastric hyperacidity, a course of waters at Vichy, Ems, or Harrogate may be recommended, while those of Marienbad or Carlsbad are most suitable for the biliary and pancreatic forms of the complaint. The symptoms of chronic colitis are often much improved by a visit to Plombières or to some watering-place where a similar form of treatment is carried out.

Diet.—A careful examination of the fæces should be made in every case in order to determine, as far as possible, the relative digestion of the various constituents of the food. An excess of fat in the motions usually indicates pancreatic or biliary disturbance, the nature of which may be recognized by the presence of its characteristic symptoms. In such conditions fat meats, oily fish, eggs, and cream should be eliminated from the dietary and milk be given with caution. Excessive carbohydrate fermentation indicates the necessity of restricting the amount of starch and of substituting thin toast, rusks, or the Brusson-Jeune rolls for ordinary bread. Sugars may be allowed in moderation and the various malted and semi-digested cereal foods are sometimes employed with advantage. The total exclusion of carbohydrates has been recommended by several writers

(Schmidt, Meyer), but such prohibition is seldom advisable. Clear soups, purées of potato, peptonized milk, koumiss, curdled milk, pancreatized foods, maltine, sanatogen, weak tea and cocoa may be allowed, but malt liquors and alcohol rarely agree. Hot water, mild alkaline mineral waters, and fresh lemonade may be drunk with the meals. Green vegetables and uncooked fruits must be strictly forbidden, but potatoes, seakale, stewed celery, and cauliflower may be permitted in moderation. With excessive proteid putrefaction chicken, game, and fish should be given instead of mutton, beef, or veal. When catarrh of the intestine or gastric subacidity is present, a prolonged course of milk, curdled in the manner recommended by Metchnikoff, is often of the greatest service, a pint or more being taken each day. When it agrees, not only do the symptoms of indigestion abate in a remarkable manner, but the general nutrition improves and the diarrhœa disappears. I have never observed any good to ensue from the administration of the tablets or powders of the dried bacilli nor of sweets which are supposed to contain the lactic organisms in an active state.

Medicinal.—Drugs are administered with three objects, namely, to assist digestion, to counteract intestinal fermentation, and to regulate the action of the bowels. Artificial digestives are of limited value, and pepsin, papain, hydrochloric acid, and other adjuvants of gastric digestion are useless when the disorder is situated in the intestine. On the other hand, the pancreatic preparations and Holadin sometimes appear to be beneficial, or takadiastase may be prescribed with advantage in amylaceous indigestion. Eunatrol and oleate of sodium are of distinct value when there is reason to suspect a deficient elimination of bile. Pills containing dried gall or soap are strongly advocated by some practitioners. Excessive intestinal fermentation usually indicates the need of antiseptics, of which the most

reliable are carbolic acid, creasote, guaiacol, dimol, and bismuth salicylate. The first-named may advantageously be combined with nitrohydrochloric acid and glycerin, while guaiacol is given in the form of capsules. Creasote, in combination with podophyllin and rhubarb, forms a pill suitable for almost every case in which constipation exists, and it also helps to clean the tongue and improve the appetite. The bismuth salt is chiefly indicated when diarrhœa exists, and if combined with the compound powder of opium serves to relieve the griping pains in the abdomen.

Resorcine is chiefly of value in children. A few drops of Vanadine administered after each meal should be tried when other remedies fail. Salol, naphthol, and the salts of strontium are also favourite remedies. Half a grain of grey powder or a sixth of a grain of calomel administered night and morning is often successful in controlling fermentation in the intestines, and should always be given in refractory cases, or a drachm of the solution of perchloride of mercury may be prescribed twice a day after meals. Whether the disorder is attended by constipation or diarrhœa it is advisable to commence the medicinal treatment by a dose of castor oil, as this simple expedient will often relieve the pain and distention and also stop the loose actions of the bowels. As a regular aperient, a mixture of cascara, maltine, and glycerin given each night is an excellent remedy ; while purified petroleum or one of its compounds is efficacious in some instances. Salts are chiefly indicated when gastric hyperacidity exists or the presence of gall-stones is suspected, and of these a mixture in equal parts of the dried sulphate and phosphate of sodium is the most reliable. A dessertspoonful dissolved in a tumblerful of hot water is given one hour before breakfast and may be preceded occasionally by a mercurial pill at night. Tonics of all kinds should be prohibited.

(a) CHRONIC PANCREATITIS

It is only of recent years that inflammation of the pancreas has become recognized as a condition of frequent occurrence and of considerable clinical importance, and our present knowledge of this obscure disease is chiefly due to the work of Opie, Cammidge, Mayo Robson, and others who have made the organ the subject of special research.

At an early stage of the complaint, the inflammatory mischief is usually interlobular or interacinous in its distribution, but with the progress of time the interstitial tissue becomes much increased in amount and a more or less diffuse cirrhosis results. In typical cases the entire gland is somewhat enlarged, its texture unduly hard, and its constituent lobules more clearly defined than in the normal state; but occasionally the disease is limited entirely to the head of the organ. On microscopical examination the increase of fibrous tissue between the lobules is found to be accompanied by an extensive destruction of the glandular acini and a serious interference with the blood supply of the islands of Langerhans. In the interacinar variety the cell-islands are involved at an early period of the complaint and death may ensue from diabetes before the gland exhibits any changes visible to the naked eye.

Etiology.—According to Opie, the common bile-duct grooved or pierced the pancreas in 62 per cent. and passed behind the gland in 38 per cent. of the cases he examined. It is probable, therefore, that in about three-fifths of all cases where the head of the gland is enlarged, symptoms of biliary obstruction will occur, while in the remaining two-fifths this complication will not be observed.

The mode of entry of the biliary and pancreatic ducts into the duodenum is also liable to at least six variations which are of considerable importance in the causation and symptomatology of pancreatitis. In the first, the common duct enters the ampulla of Vater along with the duct of

Wirsung; in the second, the latter joins the common bile-duct some little distance from the bowel and the ampulla is absent; while in the others the two ducts either open side by side in the duodenum without the intervention of an ampulla, or the bile-duct is associated with the accessory duct of Santorini, and the duct of Wirsung enters the bowel separately. In rare instances the pancreas possesses three distinct ducts, only one of which is connected with the bile-duct. It will, therefore, be seen that a primary infection of the common bile-duct, while extremely liable to affect the pancreas when the main duct of the latter enters the duodenum along with it, is less likely to prove injurious in cases where the ducts remain separate. It has also been shown by Opie that, owing to a deficient anastomosis between the two principal ducts of the pancreas, the duct of Santorini is rarely able to act as an efficient safety-valve when an obstruction of Wirsung's duct occasions retention of secretion.

Chronic pancreatitis, in a large proportion of the cases, is caused by the presence of a stone in the lower end of the common bile-duct, which either directly compresses and irritates the tissue of the gland or by inducing cholangitis causes an infection of the pancreatic duct with which it is closely connected. In other instances, the disease ensues from direct extension of inflammation from the duodenum to the duct or by regurgitation of the contents of the bowel, it having been proved by experiment that the introduction of the bacillus coli or fæcal material into the duct of Wirsung is followed by inflammation of the glandular tissues. Chronic ulcer of the duodenum or stomach is sometimes followed by pancreatitis from the same cause, while the perigastritis that ensues from gastric carcinoma occasionally gives rise to an inflammatory induration of the organ. Finally, an attack of enteric fever, influenza, syphilis, or tuberculosis may be followed by the clinical indications of pancreatitis,

while in rare instances the chronic type of the disease ensues from an acute or subacute inflammation of the gland.

Symptoms.—It is usually the custom to regard chronic inflammation of the pancreas as a condition which can seldom be recognized during life. This, however, is a mistake, since in a very large proportion of the cases the complaint may be diagnosed with certainty if all the phenomena connected with it be taken into careful consideration.

The general symptoms which portray its existence vary both in their nature and severity according to its cause. Thus, when gall-stones constitute the primary complaint, there is often a history of former attacks of paroxysmal pain in the right hypochondrium and epigastrium, followed, perhaps, by jaundice or fever; while in those instances where a stone has become impacted in the common bile-duct icterus may have persisted for a considerable time. It is important to remember, however, that the lodgment of a calculus in the common duct does not necessarily produce permanent jaundice, since local dilatation of the canal sometimes ensues which permits the stone to float in the secretion and thus to act as a ball-valve. In cases of this latter kind sudden physical exertion or an energetic peristalsis of the bowel may cause the stone to become fixed in the distal end of the duct, with the result that the infected secretions of the liver and pancreas are retained in their respective channels.

Under these circumstances the patient experiences a general malaise, accompanied by chilliness, shivering, fever, and jaundice, and suffers from nausea, flatulence, headache, and loss of appetite. After a few days' rest in bed, the temperature usually falls and the icterus and other symptoms disappear.

When pancreatitis arises from duodenal ulcer or other condition independent of cholangitis, the complaint develops very insidiously and many months or even years may elapse

before its symptoms become sufficiently serious to attract attention. In such cases the principal subjective phenomena are those of gastric and intestinal indigestion. Discomfort after meals, with flatulence, acidity, nausea, and mental apathy are almost invariably present, and much dislike may be expressed to fat and oily forms of food. The ingestion of butter, meat-fat, and sometimes of cream and eggs greatly increases the dyspepsia and is liable to be followed by vomiting of an oily material which assumes the appearance of granular fat as it cools. At a later stage, colicky pains in the bowels, borborygmi, and the frequent passage of offensive flatus add materially to the sense of general discomfort. It is noticeable that the patient is not only anæmic, but that the colour of his skin varies almost from day to day, being sometimes merely sallow, while at others the tint is distinctly yellow and attended, perhaps, by brownish stains on the lower eyelids, malar bones, or temples. These abnormal colorations of the skin vary with the severity of the digestive symptoms and are accompanied by extreme lassitude, mental depression, and cutaneous irritation. Occasionally a mental shock, a physical injury, or a surgical operation is followed by melancholia or other form of insanity. Sooner or later progressive emaciation makes its appearance, and although the actual loss of weight may not exceed a few ounces each week, the downward grade is steadily maintained. At this period of the complaint, or even earlier, the constipation which had formerly been in evidence is often replaced by an irritable state of the bowels, the evacuations being frequent, large, white, offensive, and of greasy consistence. The urine is diminished in quantity and may contain both bile and sugar.

The subsequent course of the disease varies with its mode of causation. When biliary calculus or cholangitis exists, the enlargement of the head of the pancreas is apt to induce

jaundice, which gradually increases in severity until the skin acquires a uniform mahogany hue. If, however, the common bile-duct happens to be situated behind the gland this symptom need not develop. The disturbance of digestion continues to excite much discomfort and to increase the tendency to malnutrition, hæmorrhages may occur in the skin or from the mucous membranes, and death finally ensues either from exhaustion or from some intercurrent condition, such as diabetes, biliary toxæmia, or pneumonia. In other cases, and especially where the pancreatic inflammation has followed ulcer of the duodenum, the symptoms of the primary disease continue to take precedence of those arising from the secondary complaint, and the characteristic indications of gastric hypersecretion with progressive emaciation engage the sole attention until the accidental discovery of fat in the fæces or a pancreatic reaction in the urine demonstrates the coexistence of chronic pancreatitis. A certain number, however, develop the symptoms of diabetes or insanity, from which death ensues within a comparatively short space of time.

Physical Signs.— Examination of the abdomen rarely affords any definite evidence of pancreatitis. Tenderness on pressure exists in about one-half of the cases and may only be elicited by deep palpation. When spontaneous pain exists, the recti muscles are often so rigid that the most careful manipulation fails to detect any enlargement of the gland; but occasionally, even without an anæsthetic, the head of the pancreas may be felt as a swelling situated behind the stomach and endowed with pulsation communicated to it by the underlying aorta. When jaundice exists without gall-stones, a painless enlargement of the gall-bladder may sometimes be detected. Jaundice is present in about three-fifths of all cases, but in many instances it is either slight or intermittent until a late stage of the complaint. The two principal signs of diagnostic importance

are an excess of fat in the fæces and a pancreatic reaction in the urine. In advanced pancreatic disease the stools are large, white, soft, acid in reaction, and possess a characteristic smell. These peculiarities are due to the abnormal quantity of undigested fat they contain and to the excessive fermentation that exists in the lower bowel. White stools are commonly supposed to indicate an absence of bile from the intestine, but it is quite certain that they also occur without biliary obstruction in cases where a large excess of neutral fat mixed with crystals of fatty acids is evacuated, since the extraction of the fat with ether leaves a dark brown residue similar to that obtained from normal fæces (Cammidge). The existence of undigested muscle-fibre has been noted in several cases of cancer of the pancreas and is also met with in severe examples of pancreatitis. As a rule, it can only be detected by microscopical examination, but occasionally it is visible to the naked eye. Experiments conducted upon animals from which the pancreas has either been partially or entirely removed, show that only one-third to one-half of the proteids of the food are absorbed, and in chronic pancreatitis a similar proportionate waste is observed. Very rarely do the stools exhibit any indication of impaired starch digestion, although it is certain that a much diminished amylolysis must result from the destruction of the pancreatic tissue. It is probable that in these cases the starches are slowly converted by bacterial fermentations into maltose, which is subsequently split up into various organic acids and gases.

By the employment of his method, already described, Cammidge found that chronic pancreatitis associated with obstruction of the bile-duct interferes almost as much with fat digestion as malignant disease of the pancreas, where the average amount of total fat found in the dried fæces was 77 per cent. That the high proportion of fat met with in some of these cases is not entirely due to the biliary

obstruction is shown by the fact that as great an excess has been found in others in which no obstruction to the free flow of bile into the intestines was present. Mild types of pancreatitis in which only the head of the gland is affected are not necessarily accompanied by steatorrhœa. The relative proportions of the neutral fats and fatty acids vary under different conditions.

Diagnosis.—Chronic pancreatitis has chiefly to be distinguished from cancer of the head of the gland. In this latter disease the general failure of health and loss of flesh are early and progressive symptoms and when jaundice supervenes it becomes absolute and permanent. The gall-bladder is greatly distended, but rarely tender. The liver is much enlarged, smooth, and painless owing to extreme engorgement with bile. Occasionally a hard, nodular growth lying behind the stomach may be felt in the region of the navel. The fæces contain a large amount of undigested fat, only a comparatively small proportion of which consists of fatty acids. The pancreatic reaction in the urine (C reaction) is negative in three-quarters of the cases, but in the remainder a more or less marked reaction is obtained, probably as a result of secondary inflammatory changes in the gland. Severe, constant pain is often experienced in the back, and metastatic growths may develop in the substance of the liver. The emaciation and debility are much more rapid than in simple pancreatitis, and death usually ensues within fifteen months.

The *prognosis* of chronic interstitial pancreatitis, unless improved by operation, is extremely grave, for although life may be preserved for several years, death usually ensues from asthenia, diabetes, hæmorrhage, or some other complaint.

Treatment.—The disease so often arises from gall-stones, duodenal ulcer, and other conditions that are amenable to treatment, that the possible sequence of pancreatitis in

such complaints should always be borne in mind and every effort be made to effect a cure either by medicinal or surgical means. In the various zymotic and constitutional diseases which are apt to give rise to inflammation of the gland the processes of digestion should carefully be watched, and if obstinate symptoms of dyspepsia ensue repeated examinations should be made of the stools and urine for indications of disturbed metabolism.

Diet.—Chronic pancreatitis usually affects all the ferments of the gland and especially that which splits up the neutral fats. For this reason care should be taken to throw as little stress as possible upon the functions of the organ by the selection of an appropriate dietary. An excess of starchy foods should be omitted in favour of partially digested cereals and sugars, and with this object toast is usually preferable to bread, and the various artificially pancreatized or malted foods to oatmeal, sago, or tapioca. Potatoes do not disagree, at any rate during the earlier stages of the disease, but uncooked green vegetables and fruit produce flatulence. As a rule, milk is easily digested, and 2 or 3 pints, diluted if necessary with lime-water, may be given during the course of each twenty-four hours. Cream, on the other hand, is distasteful to many patients, but fresh butter is often digested without apparent difficulty. The increased peptic digestion which is apparent in so many cases of pancreatitis, and especially in those which ensue from gall-stones, compensates to a great extent for the deficiency of trypsin, but it is advisable to select those varieties of animal food which are most easily soluble in the stomach. Lightly roast or grilled beef or mutton may be allowed once a day, while pigeon, chicken, game, white fish, tripe, and sweetbreads are excellent substitutes for the less digestible forms of butcher's meat. Veal, pork, and meat-fats should be avoided, and ham and bacon be tried with caution. Eggs are very apt to produce nausea.

In all cases the stools should be carefully watched, and if they are found to contain an excess of meat-fibre the diet must be readjusted. Alcohol in any form is apt to produce acidity, but sometimes a little white wine diluted with soda-water appears to increase the appetite without disturbing the functions of the stomach. The "Nonal" brands of ale and stout, which are practically devoid of alcohol, are very palatable and well worthy of trial. Tea is apt to give rise to acidity, but coffee with milk or cocoa made from the nibs or husks may usually be allowed.

Medicinal.—The chief indications for medicinal treatment are the maintenance of the general nutrition and the control of excessive putrefaction in the intestines. In view of the partial suppression of the pancreatic functions, it is always advisable to try the artificial preparations of the gland either in the form of the pancreatic emulsion, pancreatin, the glycerin extract, or the keratin-coated pill; but it is doubtful whether the liquor pancreaticus is of any value after its passage through the stomach. The various preparations of malt may be employed with advantage, either alone or mixed with the food, or takadiastase may be prescribed before meals. When emaciation is a marked feature of the complaint, cod-liver oil or its emulsion may sometimes be given with success.

When pancreatitis is associated with a stone in the common bile-duct, olive oil should always be given a trial, a sherry-glassful being administered each morning before breakfast. Unfortunately, however, many persons find the treatment very distasteful, and under these circumstances it should be omitted in favour of the eunatrol pill (4 grains), two or more of which may be given before each meal, or of the oleate of sodium (10 grains) in a capsule three times a day after food. Sometimes aspirin may advantageously be combined with the oleate, or the pil. cholelith be prescribed. The bowels should always be carefully regulated. When

gastric hyperchlorhydria is present, a saline draught before breakfast is of the greatest value, but if the gastric secretion is normal or subacidity exists, recourse should be had to the confection of sulphur and guaiacum or to a pill containing podophyllin, creasote and rhubarb. The treatment of symptoms arising from secondary intestinal putrefaction should be carried out on the lines already laid down for the management of chronic intestinal indigestion. In all cases where medicinal treatment has failed to effect a cure, it is advisable to consider the question of surgical interference.

(3) DUODENITIS

The duodenum is apt to be involved by any inflammation which affects the stomach or the intestines, but it is doubtful whether duodenitis ever occurs as an independent disease. From the point of view of etiology, two principal varieties, the primary and the secondary, require consideration.

Primary duodenitis is produced by the same conditions that give rise to acute gastritis. In early life, exposure to cold or wet is a common cause of the complaint, especially when the child is suffering from general malnutrition. In other instances an excess of food or the ingestion of substances which are difficult of digestion is responsible for an attack, while occasionally a natural idiosyncrasy renders some article of diet, which is otherwise harmless, injurious to the alimentary canal. Acute gastro-duodenitis frequently ensues from the use of decomposing meat, fish, vegetables, fruit or of infected milk or water, in all of which cases either ptomains, toxalbumins, or pathogenic bacteria find direct entrance to the body and exert their specific deleterious influence upon the mucous membrane of the digestive tract.

Occasionally a severe and destructive inflammation arises from the action of such poisonous substances as corrosive

acids and alkalies, metallic salts and alkaloids, or acute gastro-duodenitis appears in the form of an epidemic disease of which the chief symptom is jaundice.

Duodenitis of secondary origin is far more common than the primary variety and is a constant accompaniment of all diseases of the stomach attended by decomposition of food or by a permanent excess of free hydrochloric acid. Local diseases of the duodenum, such as ulcer and cancer, are also associated with a more or less extensive inflammation of its mucous membrane, and a similar condition often ensues from gall-stones, hepatic abscess, cholangitis, pancreatitis, cancer of the pancreas and new growths or tubercle of the right kidney. Chronic toxæmias, such as result from suppuration, phthisis, nephritis, retention of urine, and septicæmia are apt to be accompanied by gastroenteritis, the various poisons present in the circulation being partly eliminated by the mucous membrane of the alimentary tract. Diseases of the heart, emphysema, and interstitial pneumonia are all accompanied by a chronic congestion of the portal system which predisposes to inflammation of the duodenum, while acute pneumonia and the majority of the acute specific fevers are liable to be attended by acute gastro-duodenitis during their febrile stage.

Symptoms.—The general symptoms of acute duodenitis are identical with those of acute inflammation of the stomach. The onset is comparatively abrupt and often attended by slight shivering, headache, general malaise, and pain in the upper part of the abdomen. Retching and vomiting are almost invariably present, and may persist for many hours, the ejecta being composed of alkaline, bile-stained mucus. Excessive nausea is a prominent feature in many cases and there is a pronounced aversion to all forms of food. In the primary varieties, and especially in the infective form of the complaint, the temperature of the body rises at once to 100° to 103° F., and, after displaying an intermittent

character for three or four days, gradually falls to normal. The pulse is usually quick and feeble, but in cases of toxic poisoning it is sometimes unduly slow or intermittent. The tongue is covered with a creamy fur, the breath is sweet or offensive, and herpes often develops upon the lips. The urine is scanty, high-coloured and deposits urates on standing. Occasionally, acute duodenitis is accompanied by a paroxysmal pain in the abdomen, localized above and to the right of the navel, and so severe as to simulate biliary colic. If the stomach and duodenum alone are affected by the inflammation, the bowels are usually confined and the stools are hard, pale, and offensive; but if the jejunum is implicated a peculiar form of diarrhœa, characterized by the evacuation of acid, sour-smelling brownish or gelatinous motions, is often observed. In these latter cases pain in the abdomen and an action of the bowels often occur immediately food is introduced into the stomach. Inflammation of the large intestine is attended by attacks of colic and by liquid motions containing an excess of mucus. The localizing symptoms of duodenitis depend upon an inflammatory obstruction of the common bile-duct. This phenomenon is by no means constant even in severe cases, and is probably more frequent when the duct opens into the bowel by a small orifice than at the summit of a papilla.

When it occurs, the skin and conjunctivæ become jaundiced on the third or fourth day and the urine is found to contain a large amount of bile. The intensity of the jaundice varies in different cases, in some being very slight and only enduring for a few days, while in others the skin presents a deep saffron hue for six weeks or longer. In the more persistent cases the liver is uniformly enlarged, smooth, and painless, but the gall-bladder can seldom be detected. The stools are white and offensive and may be shown to contain a great excess of fats and fatty acids. Although simple duodenitis always terminates by recovery, many persons

continue to suffer from flatulence, nausea, want of appetite, and general malaise for months or even years after an attack of "catarrhal jaundice," accompanied in many instances by sallowness of the complexion, mental depression, lassitude, irritability, insomnia, and a marked disinclination for fats and sweets. The bowels are sluggish and the stools paler and more offensive than in health. Examination of the urine demonstrates the occasional presence of bile and not infrequently the pancreatic reaction may be detected. These sequelæ are far more common than might be supposed, and it is by no means unusual for a patient suffering from symptoms of this nature to ascribe his indigestion or "biliousness" to a former attack of jaundice. There can be no doubt that such symptoms are really due to a mild form of pancreatitis, which occurred simultaneously with the infection of the common bile-duct, but did not subside after the cure of the duodenitis, while the occasional existence of bile in the circulation suggests that the ampulla of Vater is also apt to remain in a state of incipient inflammation.

Recurrent Acute Duodenitis.—There is one clinical variety of the complaint which, owing to its frequent recurrence and severe symptoms, deserves special recognition. It is usually encountered about middle age, and in many cases there exists a strong family predisposition to diabetes. Several of my patients had previously suffered from symptoms suggestive of gall-stones and possessed an enlarged and fatty liver. Each attack exhibits the same general features. After exposure to cold, the patient is seized with chilliness or actual shivering, the epigastrium becomes distended and tender, nausea, flatulence, and headache ensue, and finally vomiting occurs. The temperature rises abruptly to 101° or 103° F., the pulse is accelerated, and there is often great irritation of the skin. Within the next twelve hours jaundice develops and the stools present the usual white appear-

ance. Abdominal pain in the true sense of the word is never experienced, although there may be considerable discomfort from gaseous distention of the stomach and intestines. The gall-bladder is rarely palpable, but there is often tenderness on pressure over the right lobe of the liver and duodenum. Each attack lasts about three days, at the end of which time the temperature falls and the icterus rapidly diminishes. Cases of this description are usually regarded as examples of gall-stones, and the absence of pain is explained by the passage of biliary sand rather than a definite calculus. A little consideration, however, will usually show that the mischief is really situated in the ampulla of Vater and involves the pancreatic as well as the common bile-duct. Exposure to cold plays an important part in the etiology of the disorder, and many patients invariably suffer from an attack if they sit in a draught, get their feet wet, or loiter about in a cold wind. True pain is conspicuous by its absence, and however severe may be the sensations due to flatulent distention, the characteristic phenomena of biliary colic are never observed. Again, the febrile attack is quite different from that which attends the passage of a stone down the cystic or common bile-ducts, while the absence of an enlarged and tender gall-bladder and the comparatively short duration of the complaint negative the supposition of cholecystitis.

The fact that in many instances the urine affords the pancreatic reaction suggests that the duct of Wirsung, as well as the common bile-duct, suffers from inflammation and partial obstruction; while the symptoms of disordered digestion so closely resemble those of acute gastritis that the coexistence of this disease with the inflammation of the duodenum hardly admits of doubt.

The chief difficulty of diagnosis is the distinction between acute duodenitis and a floating stone in the common bile-duct, which by its ball-valve action gives rise to a periodic

obstruction to the flow of bile and infective febrile jaundice. In the former complaint, however, an antecedent attack of biliary colic can rarely be ascertained and when properly treated a cure usually results, while in the latter the patient has invariably suffered from typical colic and a cure rarely ensues without resort to operation.

Treatment.—The treatment of inflammation of the duodenum is the same as that of acute gastritis (Chapter IV). When the patient can tolerate olive oil, a sherryglassful each morning before breakfast usually removes the jaundice within ten days and often prevents secondary pancreatitis. In cases of recurrent duodenitis exposure to cold must be carefully guarded against and indulgence in alcohol, cream, fruit, and strong tobacco should be prohibited. In my experience the most successful treatment is the daily administration of a saline aperient before breakfast combined with a prolonged course of eunatrol or oleate of sodium and aspirin after meals.

(4) ENTEROSPASM

This complaint, which is probably a mixed sensory and motor neurosis of the intestine, is of considerable practical importance, since it is extremely apt to be confounded with other painful affections of the abdominal organs. The reality of its occurrence has been proved by exploratory operations undertaken for the purpose of diagnosis, when portions of gut, varying in length from 3 to 15 inches, have been discovered pale, empty, and rigidly contracted, but quite free from disease. When the spasm disappears the intestine is observed to resume its normal colour and appearance and to permit the passage of gas and fluid through its canal. This peculiar condition may affect any part of the bowel and even different regions at the same time, but it is most frequent in the large intestine and more especially in the ascending colon and sigmoid flexure.

A painful spasm of the wall of the gut may be induced by almost any kind of local irritation, such as the presence of undigested food, slight mechanical obstruction, chronic tuberculous peritonitis, enlarged mesenteric glands, a foreign body, or acute inflammation of its tissues. It is also a well-known symptom of poisoning by lead, copper, and other chemical substances, of certain diseases of the nerves and spinal cord, of gout, rheumatism, diabetes, and purpura. But apart from these and other allied conditions, there exists an important form of the complaint in which the painful spasm appears to be chiefly excited by a psychical disturbance of the higher nervous centres. In such cases, sudden fright, anxiety, excitement, or mental exhaustion is followed immediately by a characteristic attack which, after enduring for a considerable time, vanishes almost as suddenly as it appeared.

A careful consideration of the various cases which have come under my notice has convinced me that there exists at least two clinical forms of the disease, one of which is met with in children and tends to undergo spontaneous cure, while the other constitutes a very serious and intractable complaint during adult life.

The Enterospasm of Childhood. — Out of fifty-seven examples of this complaint which have come under my notice, forty-four occurred in girls, and with only five exceptions the first attack developed before the age of twelve years. In 66 per cent. of the cases one of the parents had suffered from phthisis. Chronic enlargement of the tonsils or cervical glands, otorrhœa, or anæmia was a frequent accompaniment of the digestive disorder.

Symptoms.—Paroxysmal pain in the abdomen constitutes the characteristic feature of the disease. As a rule, an attack begins about midday or in the evening, but occasionally it develops during the night. Its onset is so sudden that the child may be cheerfully playing one moment and

screaming with pain a few minutes later. During an attack the face is pale and drawn, the forehead covered with sweat, and the pulse small and quick, while in some instances actual collapse supervenes. The umbilical region is the part of the abdomen to which the pain is usually referred, although not infrequently the ascending or descending portions of the colon seem to be particularly affected or the sensation slowly passes from right to left across the belly. The pain may be severe from its commencement, but it usually increases in intensity until a maximum is reached, after which it gradually subsides. At other times it disappears as suddenly as it commenced or is obviously relieved by the expulsion of gas from the bowel. Some patients invariably vomit when the pain begins and may continue to retch throughout the attack, but this symptom is by no means invariable. Its duration varies from five minutes to several hours, the nocturnal attacks being usually the most prolonged. The affected region of the abdomen is sometimes rigid and tender on pressure, but more commonly palpation affords relief and the child will often press its fists or even the corner of a chair into the abdomen when a seizure occurs. There are certain conditions which appear to favour or even to excite an attack. Constipation is an almost invariable accompaniment of the disorder, and it may usually be noticed that the pain is aggravated by the presence of an overloaded colon. In some cases an attack will occur immediately after the ingestion of food or hot liquids, while in others exhaustion from want of nourishment appears to excite the pain. The habit of sending children to bed with the stomach empty is responsible in many cases for a nocturnal attack. Physical and mental fatigue are important factors in the causation of the symptom, and consequently the incidence of the pain often coincides with over-exercise or the preparation of a laborious task for school on the follow-

ing day. The state of the appetite varies considerably, but it is usually capricious and the patient exhibits a distaste for meat-fat, eggs, and certain forms of sweets. Sour and acid substances, on the other hand, are regarded as special dainties, and both lemons and vinegar are taken with avidity. Thirst is a very prominent symptom, and existed in 63 per cent. of my cases. The sensation is chiefly experienced at night, when the child will often rise from bed and drink any fluid that it can find. Constipation is present in more than three-quarters of the cases and increases as the disease progresses. The stools are sometimes hard, pale, and fœtid, at others they resemble putty or mortar, while occasionally they consist of scybala mixed with mucus. In about one-quarter of the cases, discomfort ensues immediately after meals and a lienteric form of diarrhœa is observed, the stools being liquid or semi-solid and composed of undigested food. Some children invariably pass a motion as soon as an attack of pain comes on, but the evacuation never exhibits the ribbon or pipe-stem appearance that is met with in the adult form of the complaint.

Although there may be no actual loss of flesh, the child remains thin and anæmic and never seems to improve in general health. The hands and feet are cold and blue and are very liable to chilblains. Aphthous ulceration of the tongue, gums, or palate is a troublesome complication in many cases. After the age of puberty the various symptoms of the complaint usually subside, but the patient may be subject to occasional attacks of gastritis and not infrequently develops the symptoms of gastric neurasthenia.

In view of the tuberculous history which existed in such a large proportion of my cases, the observations of Carson upon the Clinical Aspects of Tuberculous Mesenteric Glands are of particular interest. Thirty-seven out of his fifty cases occurred before the age of fifteen years, and the sudden severe attacks of pain, which he rightly attributed to entero-

spasm or colic, were identical in character with those just described. In all cases he discovered old tuberculous disease of the mesenteric glands, especially located near the lower ileum and cæcum, and occasionally associated with adhesions or other evidences of former peritonitis. It is probable that many of my cases were really suffering from chronic mesenteric disease; but the fact that recovery ensued, so far as I am aware, in every instance, and many were watched over a period of several years, proves that the enterospasm may disappear in the absence of complications or further manifestations of tuberculous inflammation in the abdomen.

Treatment.—Exposure to cold must be avoided and a flannel or woollen binder should be worn throughout the year. Tepid baths of sea-water are useful in maintaining a healthy action of the skin, and regular but not excessive exercise in the open air should be encouraged. A bracing climate is most suitable for these cases.

The selection of an appropriate dietary seldom presents any difficulty. All articles of food which contain a large percentage of indigestible material must be avoided, and hence green vegetables and fruits should be prohibited. Condiments and highly spiced foods must also be forbidden on account of their stimulating influence upon the peristalsis of the stomach and intestines. The meals should be given at regular intervals, and it is usually advisable to administer bread and milk, gruel, tapioca, or other light food about half an hour before the child retires to bed.

The most prominent indication for medicinal treatment is the regulation of the bowels. As a rule, a mixture of the liquid extract of cascara, maltine, and glycerin given at bed-time answers best, or the confection of senna and sulphur may be prescribed in appropriate doses. A full dose of castor oil administered immediately the pain commences seldom fails to cut short an attack. Drastic and saline

purgatives often increase the tendency to pain. When the bowels act immediately after meals, sedatives are required to relieve the abnormal irritability of the intestine, and with this object a small dose of nepenthe, compound tincture of camphor, or morphine, combined with aromatic sulphuric acid should be given twice a day before food. Occasionally a few drops of tincture of nux vomica and dilute nitric acid taken before meals effect a rapid cure. As soon as the bowels have been brought into a satisfactory condition, an attempt should be made to cure the anæmia by means of the ammonio-citrate or tartrate of iron. When the attacks of pain occur frequently a few minims of the tincture of belladonna may advantageously be combined with the iron preparation.

The Enterospasm of Adults.—This disorder is comparatively rare in general practice, but is quite familiar to the specialist. In my series of cases it constituted nearly 8 per cent. of those classified as intestinal dyspepsias.

Both sexes are equally affected, but it rarely develops before twenty years of age. It is exceptionally frequent among artists, musicians, painters, and those engaged in employments which necessitate severe mental effort. Occasionally, the tendency to it appears to be inherited, and in a large proportion of the cases one of the parents is found to have suffered from neurasthenia, migraine, epilepsy, or asthma. It is also relatively frequent in families that possess a strong liability to tuberculosis. Many sufferers from the complaint refer the first attack to a severe accident, fright, an acute illness, prolonged mental or physical strain, to the ingestion of some indigestible substance, or to the abuse of purgatives; but it also frequently develops without apparent cause and during a period of perfect health.

As a rule, the attack commences quite suddenly, but occasionally the patient is warned of its advent by some particular symptom which he has learned to associate with

it. Thus, in some cases the pain is preceded for hours or even days by distention of the abdomen, oppression at the chest, an irregular action of the heart, asthma, weariness, or vertigo, while in others slight shivering, numbness of the hands, feet, or tongue or discomfort in the rectum proves an invariable prelude to an attack. The pain itself is usually abrupt in onset and violent from the first; but occasionally it commences by a sense of uneasiness in one part of the abdomen which steadily increases until it becomes almost intolerable. Its location varies in different cases, and even during the course of a single attack its maximum intensity may shift from one part of the abdomen to another. Vomiting is an inconstant feature and the temperature is never elevated; indeed, when the pain is exceptionally violent it is sometimes accompanied by partial collapse. During the height of an attack the patient is unable to stand or even to sit and usually lies upon his back with the knees drawn up and the hands clasped over the belly. Micturition may be difficult or painful. On examination, the face is found to be pale and drawn, the pulse quick and feeble, the surface of the body cold, and the forehead covered with sweat. The abdominal wall is usually rigid, and pressure relieves rather than increases the suffering. In thin individuals the contracted colon may sometimes be felt as a hard cord, but if the attack has already persisted for several hours, gaseous distention of the surrounding coils of intestine may obscure this important sign. The finger inserted into the rectum is often firmly grasped by the contracted bowel. The severe attacks rarely persist for more than twelve hours, but the milder seizures may continue, with occasional remissions, for days or even for several weeks. As long as pain exists, the appetite remains in abeyance and food produces flatulence and discomfort, but thirst is rarely observed. The subjects of enterospasm invariably suffer from obstinate constipation, and during

an attack the stools are often thin and ribbon-like, owing probably to concomitant spasm of the rectum. When the disease is well established, each patient usually discovers for himself the condition which most frequently excites pain. Thus, in some instances physical or mental fatigue is the most potent factor in its causation, in others worry, anxiety, or excitement, while not infrequently exposure to cold or merely standing for a time on a stone pavement or damp grass is invariably followed by an attack. Women rarely suffer from enterospasm during the later months of pregnancy, although the disease is apt to return immediately after delivery. It often ensues after a physical injury or a surgical operation. The attacks recur at irregular intervals which vary from a few weeks to several years, and although a cure is sometimes observed, the complaint often persists until an advanced period of life.

Diagnosis.—A correct diagnosis of enterospasm may usually be made by careful attention to the history of the case and to its characteristic clinical features. Unlike other painful diseases of the abdomen, an attack may often definitely be attributed to some psychical disturbance, such as worry or excitement. The pain is abrupt in onset, violent, and localized to some particular region of the abdomen, especially to the ascending colon or sigmoid flexure, and on examination the affected portion of the bowel may be felt like a hard and somewhat tender cord. In bad cases collapse with a subnormal temperature may exist, and there is usually a history of previous seizures of a similar character. The pain often disappears as soon as the bowels have been evacuated by castor oil.

At its commencement the disease may easily be confused with perforation of the stomach or duodenum, biliary, renal, or lead colic, the crises of tabes dorsalis, or with appendicitis. A little care, however, will generally suffice to exclude these various complaints, while a history of previous attacks in

which the pain occupied other regions of the abdomen will at once suggest the possibility of the intestinal neurosis. Chronic intussusception in the adult may closely simulate enterospasm in its general features, but the constant vomiting, rapid emaciation, excessive tenderness, persistent tumour, and the frequent existence of diarrhœa in the former disease should distinguish it from the functional disorder. The fact that so many sufferers from enterospasm exhibit a scar over the region of their appendix is not only an eloquent testimony to the frequency with which spasm of the ascending colon is confused with inflammation of the cæcal appendage, but also serves to emphasize the uselessness of the operation as a curative treatment of the disease. The sudden onset and extraordinary severity of pain unattended by fever ought to negative the probability of acute inflammation, while the absence of localized tenderness, the existence of a cord-like tumour, and the peculiar appearance of the stools are quite opposed to the theory of appendicitis. In my own practice I have seen several cases of chronic duodenal ulcer which had been mistaken for enterospasm, on account of the periodic attacks of pain with comparative freedom from discomfort in the intervals. The pain of duodenal ulcer is, however, quite distinct from that of the intestinal neurosis, since it usually occurs at the end of gastric digestion, is relieved by food and is particularly apt to occur during the night. Examination will also show the existence of gastric hypersecretion and afford other important evidence of ulcer in the vicinity of the pylorus.

Treatment.—This is usually unsatisfactory in so far as the cure of the disease is concerned. At the commencement of an attack the patient should go to bed, hot fomentations should be applied to the abdomen and a full dose of castor oil, either with or without tincture of opium, be administered. As soon as the bowels have been thoroughly evacu-

ated, the pain usually subsides. Injections of morphine often prolong an attack. In the intervals of his complaint, the patient must carefully avoid exposure to cold, overwork, and excitement. Green vegetables and fruit should be prohibited, and a regular daily action of the bowels be secured by means of cascara and maltine or other gentle laxative. A prolonged course of belladonna and valerianate of zinc sometimes appears to prevent a recurrence of the disease.

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